Contract No: EP-W-09-002
WA #: 033-RARA-02MP

Region 2 RAC2
Remedial Action Contract

Stage 2 Remedial Action – Round 4 Performance Evaluation Draft Report

Iceland Coin Laundry Superfund Site

Vineland, New Jersey

February 16, 2015

CDM Smith

110 Fieldcrest Avenue, #8
6th Floor
Edison, New Jersey 08837
tel: +1 732 225-7000
fax: +1 732 225-7851
cdmsmith.com

February 16, 2015

Mr. Michael Zeolla
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway – 19th Floor
New York, NY 10007-1866

PROJECT:	EPA Region 2 RAC2 Contract No.: EP-W-09-002 Work Assignment No.: 033-RARA-02MP
DOC CONTROL NO.:	3320-033-02394
SUBJECT:	Round 4 Performance Evaluation – Draft Report Stage 2 Remedial Action Iceland Coin Laundry Superfund Site Vineland, New Jersey

Dear Mr. Zeolla,

CDM Federal Programs Corporation (CDM Smith) is pleased to submit two hard copies and three electronic copies of the Round 4 Performance Evaluation – Draft Report for the Iceland Coin Laundry Superfund Site located in Vineland, New Jersey.

If you have any questions regarding this submittal, please contact me at (732) 590-4692.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

Kershu Tan, P.E. BCEE
RAC2 Site Manager

PSO: Bal

Enclosure

cc: H. Eng, EPA Region 2 (letter only)
J. Litwin, CDM Smith (letter only)
B. MacDonald, CDM Smith (letter only)
G Chen, CDM Smith
F. Tsang, CDM Smith
RAC2 Document Control

Table of Contents

List of Tables

List of Figures

Appendices

Acronyms

%	percent
bgs	below ground surface
CDM Smith	CDM Federal Programs Corporation
CEA	Classification Exception Area
cm/s	centimeter per second
DCE	dichloroethene
DHC	*dehalococcoides spp.*
DESA	Division of Environmental Science and Assessment
DO	dissolved oxygen
EAB	enhanced anaerobic bioremediation
EPA	United States Environmental Protection Agency
EVO	emulsified vegetable oil
ft/d	feet per day
ft/ft	feet per foot
ft/yr	feet per year
IDW	investigation-derived waste
MEE	methane, ethane, and ethene
mg/L	milligram per liter
mV	millivolt
NJDEP	New Jersey Department of Environmental Protection
NJGQS	New Jersey Groundwater Quality Standards
ORP	oxidation-reduction potential
PCE	tetrachloroethene
PID	photo ionization detector
PPE	personal protection equipment
QAPP	Quality Assurance Project Plan
RA	remedial action
RAC	Remedial Action Contract
RI	Remedial Investigation
ROD	Record of Decision
TCE	trichloroethene
TOC	total organic carbon
VC	vinyl chloride
VOC	volatile organic compound
µg/L	microgram per liter

Section 1
Introduction

CDM Federal Programs Corporation (CDM Smith) received Work Assignment 033-RARA-02MP under the United States Environmental Protection Agency (EPA) Remedial Action Contract (RAC) 2, Contract Number EP-W-09-002, to perform a remedial action (RA) at the Iceland Coin Laundry Superfund Site (the site) located in Vineland, New Jersey (Figure 1-1). The purpose of this report is to update the progress of enhanced anaerobic bioremediation (EAB) treatment based on the Round 4 sampling event conducted in October and November 2014.

1.1 Site Description and Project Background

The Iceland Coin Laundry Facility was located at 1888 South Delsea Drive, Vineland, New Jersey. Historical records indicate the use of tetrachloroethene (PCE) at the facility. Improper disposal of dry cleaning solvent contaminated the underlying aquifer with volatile organic compounds (VOCs), in particular PCE, and created a contaminant plume more than 5,000 feet long. Daughter products of PCE degradation such as trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC) are also present at the site. These compounds are together referred to as chlorinated VOCs. The aquifer of concern is the Kirkwood-Cohansey aquifer system, which consists of sand and some silt or clay lenses. The Kirkwood-Cohansey aquifer is a major unconfined aquifer in the area. Most residents within the contaminated area are connected to city water.

In September 2006, EPA signed a Record of Decision (ROD) (EPA 2006) selecting in-situ biological treatment, specifically EAB, as a means to remediate the groundwater contamination. In 2007, a treatability study and the remedial design were conducted. EAB treatment was performed at two areas: the Facility Area (Figure 1-2) and the Treatability Study Area (Figure 1-3). Based on the findings of the treatability study, it was recommended that EAB treatment would target treatment of the 50 micrograms per liter (µg/L) PCE plume and allow the contamination outside of the 50 µg/L PCE plume to naturally attenuate.

The RA began in 2009 and consists of three stages:

- Stage 1 – Pre-RA Investigation
- Stage 2 – Site-Wide Groundwater RA
- Stage 3 – Project Completion and Closeout

From April 2009 to the summer of 2010, the Stage 1 Pre-RA investigation was conducted to refine the vertical and horizontal boundaries of the PCE contaminant plume that exceeds 50 µg/L; to collect site-specific hydrogeological and lithological information; and to design the full scale RA treatment. A three-dimensional numerical model was also developed to predict the impact of EAB treatment over time, and to estimate the required time frame of the active EAB treatment in order to decrease PCE concentrations to below 50 µg/L. A Final Stage 1 Technical Memorandum was submitted in August

2011 (CDM Smith 2011a), which summarized the findings of Stage 1 pre-RA investigation field activities and proposed the approach for the first phase of RA treatment. The detailed plan of field activities and procedures are presented in the Quality Assurance Project Plan Addendum (CDM Smith 2011b).

From July 2011 to October 2011, a full-scale biobarrier was installed as shown in Figure 1-4. Amendment (EOS® 550LS) was injected into 32 injection wells. Subsequently, 30 of the injection wells were abandoned at the request of the property owners. As part of the Stage 2 RA, amendment (SRS®-SD) was also injected at the Treatability Study Area in October 2011.

Five rounds of samples have been collected to date: Baseline, Round 1, Round 2, Round 3 and Round 4. Baseline, Round 2 and Round 4 groundwater samples were collected from site-wide monitoring wells to evaluate site wide conditions; Round 1 and Round 3 samples were collected from the Treatability Study Area and the Biobarrier Area to evaluate treatment progress. The Stage 2 RA implementation and sample results of Baseline and Round 1 events were presented in the Stage 2 RA – Round 1 Performance Evaluation Draft Report (CDM Smith 2012). The Round 2 results were presented in the Stage 2 RA – Round 2 Performance Evaluation Draft Report (CDM Smith 2013) and Round 3 results were presented in the Stage 2 RA – Round 3 Performance Evaluation Draft Report (CDM Smith 2014).

1.2 Purpose and Organization of Report

The objectives of this report are to:

- Provide an update the treatment progress at the Facility Area, the Treatability Study Area, the Biobarrier Area and impact of these treatments to the areas downgradient
- Provide recommendations for future site activities

This report is organized into five sections:

- **Section 1 – Introduction**: Introduces the background of this project and the objective and organization of this report. The site geology, hydrogeology, and the extent of groundwater contamination are also discussed.
- **Section 2 – Field Activities**: Briefly summarizes the Round 4 sampling activities.
- **Section 3 – Results and Discussion**: Presents the Round 4 field and laboratory analytical results and provides a discussion of the EAB treatment progress based on all RA data.
- **Section 4 – Conclusions and Recommendations**: Provides conclusions based on available data through Round 4 and recommendations for additional activities to achieve the overall site remediation.
- **Section 5 – References**: Provides a list of the references used to develop this report.

1.3 Site Geology and Hydrogeology

The site geology and hydrogeology are summarized below.

1.3.1 Site Geology

The site is located within the New Jersey Coastal Plain Physiographic Province. A history of coastal submergence and emergence spanning the Cretaceous Period and Cenozoic Era is reflected in the present-day geology of the New Jersey Coastal Plain. The Coastal Plain geology is composed of a mega-sequence within a seaward (eastward)-thickening wedge of unconsolidated sediments, which ranges in thickness from zero feet on the northwestern margin of the Coastal Plain to more than 6,000 feet at the Atlantic Ocean shoreline. Underlying the Cenozoic sedimentary wedge and outcropping along the western margin of the Coastal Plain are similarly seaward-thickening unconsolidated Cretaceous age sedimentary units.

The project area is underlain by the Cohansey Sand Formation. This unit, as well as the overlying soils, primarily contains interfingered silt, clay, and sand near the ground surface, and fine to coarse sand with minor silt lenses and traces of fine gravel at depth.

The Stage 1 pre-RA investigation identified a fine-grained unit, composed of fine sand, silt, and clay interfingered in some areas with sand. This fine-grained unit is located at about 10 to 15 feet below the ground surface (bgs) to the east and northeast of the former Iceland Coin Laundry Facility. At monitoring well cluster MW-31, the fine-grained layer begins to dip, leveling off at about 50 feet bgs in the area of monitoring well cluster MW-04. It maintains a fairly uniform thickness, but undulates slightly, between MW-33I and RA-GS-31. Beyond RA-GS-31, the lithology in this layer transitions from fine- to coarse-grained, then pinches out between groundwater screening locations RA-GS-43 and RA-GS-46, as shown in Figures 3-4 and 3-5 of Appendix A. This fine-grained unit affects the contaminant migration and the implementation of the RA.

1.3.2 Site Hydrogeology

The aquifer of concern is the Kirkwood-Cohansey aquifer system, a major unconfined aquifer in the study area. In general, it is highly permeable, under aerobic conditions, and low in organic matter and calcium carbonates.

Ground surface elevations at the site are between 60 and 80 feet above mean sea level. Depth to groundwater ranges from approximately 6 to 30 feet bgs. Based on potentiometric contours of piezometers and shallow, intermediate, and deep monitoring wells, the predominant groundwater flow direction is to the southwest (CDM Smith 2011a). Horizontal hydraulic gradients were computed using water level elevations at monitoring well clusters MW-01 and MW-12 measured in July 2010. The horizontal gradients in the shallow, intermediate, and deep zones were 2.72×10^{-3}, 2.31×10^{-3}, and 2.26×10^{-3} feet per foot (ft/ft), respectively. The distance between these two well clusters is 3,890 feet. Vertical hydraulic gradients are generally downward across the site, with the largest gradients observed in between the shallow and intermediate wells. The vertical gradients between the intermediate and deep wells are small and in some cases almost zero (CDM Smith 2011a).

An aquifer test was conducted at MW-35I during the pre-RA investigation. Based on the 72-hour pumping test results, the hydraulic conductivity was estimated to range from 48 feet per day (ft/d) to 179 ft/d, or 1.7 x 10^{-2} to 6.3 x 10^{-2} centimeters per second (cm/s). This is within the range of values calculated during the Remedial Investigation (RI), which ranged from 1.13 x 10^{-3} cm/s to 7.38 x 10^{-2} cm/s, with a geometric mean of 8.51 x 10^{-3} cm/s (CDM Smith 2011a), which is equal to 24 ft/d.

The ranges of groundwater flow velocities for the shallow, intermediate, and deep zones were calculated using the estimated hydraulic conductivity from the pumping test (48 ft/d to 179 ft/d), an effective porosity of 0.15, and the hydraulic gradient estimate based on July 2010 data. The results are as follows:

- Shallow: 318 to 1,185 feet per year (ft/yr)
- Intermediate: 270 to 1,006 ft/yr
- Deep: 304 to 1,132 ft/yr

These estimated groundwater flow rates may be on the high end for this site since the pumping test was conducted at MW-35I, which is located in a sandy formation without the fine-grained unit described in Section 1.3.1.

1.4 Extent of Groundwater Contamination Prior to RA

The extent of groundwater contamination prior to the RA is summarized below. The results of groundwater screening conducted during the Stage 1 pre-RA investigation from (2009 – 2011) are shown in Figures 3-3 and 3-7 of Appendix A. The extent of the contaminant plume is summarized as follows:

- The center of the contaminant plume has migrated away from the original source, the Facility Area. The contaminant plume moved downward in the aquifer to just above and within the fine-grained unit.
- The 50 µg/L PCE plume stretched approximately 3,000 feet, from between MW-4I and MW-7I at the northeastern boundary to between RA-GS-43 and RA-GS-46 at the southwestern boundary (Figure 3-7 of Appendix A).
- The 50 µg/L PCE plume was located within a narrow thickness of approximately 10 to 15 feet, above and within the fine-grained unit (Figure 3-8 in Appendix A).
- Overall, the contaminant plume had migrated more than 5,000 feet downgradient of the Facility Area to RA-GS-49. The downgradient extent of the contaminant plume was not defined.

It should be noted that the existence of contamination within the fine-grained materials posed special challenges for the RA activities. It was difficult to distribute the amendment into the silt/clay materials. The contaminants in the silt and clay that are not treated directly would diffuse out and prolong the 50 µg/L PCE plume and the overall time needed to restore the aquifer to meet the New Jersey Department of Environmental Protection (NJDEP) groundwater standards.

1.5 Timeline of EAB Treatment and Groundwater Sampling

In order to have a holistic evaluation of EAB treatment at the site, the timeline of EAB treatment conducted during the treatability study and the RA are listed below. For discussion purposes, the three areas where EAB has been implemented (Figure 1-5) are:

- Facility Area as shown in Figure 1-2
- Treatability Study Area (also referred as the Plume Area in previous reports) as shown in Figure 1-3
- Biobarrier Area (also referred as Stage 2 RA Biobarrier in previous reports) as shown in Figure 1-4

1.5.1 Facility Area

The amendment injection and pH adjustment conducted at the Facility Area are listed below.

- May 2 – 3, 2007, injection of EOS 450 at INJ-6, INJ-7, and INJ-8 using city water
- August 1 – 3, 2007, injection of EOS 450 with pH adjustment using sodium carbonate at INJ-09 and INJ-10 using city water

1.5.2 Treatability Study Area

The amendment injection, pH adjustment and bioaugmentation conducted at the Treatability Study Area are listed below.

- April 19 – 20, 2007, injection of EOS 450 at INJ-1 and INJ-2 using city water
- April 21 – 22, 2007, injection of EOS 450 at INJ-4 and INJ-5 using city water
- June 12 – 13, 2007, pH adjustment using sodium bicarbonate in INJ-01, INJ-02, and INJ-04
- June 13, 2007, bioaugmentation in INJ-01, INJ-02, and INJ-05
- October 12 – 13, 2011, injection of SRS-SD at MW-21S, MW-21I, and MW-23I by extraction water from INJ-04.

1.5.3 Biobarrier Area

The amendment injection conducted between September 9 and October 11, 2011 included injection of EOS 550LS at 32 injection wells from INJ-11 to INJ-42 using extraction water from three extraction wells, EX-01, EX-02, and EX-03.

1.5.4 RA sampling

One round of groundwater samples was collected in 2009 during the Stage 1 RA and five rounds of samples were collected during the Stage 2 RA as follows:

- April 7 – 15, 2009, Round 7 groundwater sampling from site-wide wells (Round 7 was named as a continuation from the treatability study)
- August 29 – September 8, 2011, RA Baseline sampling from site-wide wells
- April 17 – 23, 2012, RA Round 1 sampling from the Treatability Study Area and the Biobarrier Area
- November 27 – December 6, 2012, RA Round 2 sampling from site-wide wells
- June 3 – 6, 2013, RA Round 3 sampling from the Treatability Study Area and the Biobarrier Area
- October 27 – November 3, 2014, RA Round 4 sampling from site-wide wells

It should be noted that sampling from site-wide monitoring wells including the Facility Area were conducted on an annual basis for the long-term monitoring program. Sampling from the active EAB treatment areas, the Treatability Study Area and the Biobarrier Area were conducted semi-annually to monitor the treatment progress.

Section 2
Field Activities

The Round 4 sampling event evaluated the progress of EAB treatment approximately 33 months after amendment injection at site-wide wells including the Facility Area, the Treatability Study Area and the Biobarrier Area. Synoptic water level measurements were not collected as part of Round 4 sampling event.

2.1 Groundwater Sampling

Round 4 groundwater samples were collected between October 27, 2014 and November 3, 2014; 48 wells were sampled as listed on Table 2-1. Well locations are shown on Figures 1-2, 1-3, 1-4, and 1-5.

All wells were purged and sampled using the site-specific, low-flow, minimum-drawdown sampling procedure with a 2-inch diameter Grundfos™ pump and dedicated ½-inch outer diameter Teflon™-lined polyethylene tubing as described in the Iceland Final Quality Assurance Project Plan (QAPP) Addendum (2011b). Groundwater from each well was purged continuously into a flow-through cell while water quality parameters were recorded. The water level was measured from the top of the inner casing using an electronic water level meter to monitor the drawdown. Water quality parameters were measured using YSI 600 XLM and LaMotte 2020 meters and included pH, specific conductivity, dissolved oxygen (DO), temperature, oxidation-reduction potential (ORP), and turbidity. The sample interval was considered ready to sample after water quality parameters stabilized for three consecutive readings as follows: ±0.1 for pH; ±3 percent (%) for specific conductivity; ±10 millivolts (mV) for ORP; and ±10% for DO, temperature, and turbidity. All sampling equipment was properly decontaminated between sample locations. Low-flow groundwater sampling forms are included in Appendix B.

Groundwater samples were collected and shipped to the Division of Environmental Science and Assessment (DESA) for analysis of trace VOCs, total organic carbon (TOC), nitrate/nitrite, sulfate, methane, ethane, and ethene (MEE), and alkalinity. Most of the samples were also analyzed in the field for ferrous iron using the HACH kit. In addition, six samples were shipped to Microbial Insight, Inc. and analyzed for microbial population and other biological parameters using the QuantArray analysis. QuantArray analysis provides quantification of bacteria (the functional genes) that are responsible for both anaerobic reductive dechlorination and aerobic cometabolic degradation of chlorinated ethenes. Table 2-1 summarizes the wells sampled and the analyses performed.

The investigation derived waste (IDW) consisted of purged groundwater, decontamination water and personal protection equipment (PPE). The IDW was contained in drums and disposed of properly at an offsite landfill by the IDW subcontractor.

This page is intentionally left blank.

Section 3

Round 4 Results and Discussion

The objective of Round 4 groundwater sampling was to evaluate the site-wide progress of EAB treatment. Round 4 groundwater samples were collected in October and November 2014 from a total of 48 monitoring wells. The analytical results are presented in Appendix C. A data usability assessment was performed and is presented in Appendix D. The data presented in this report are definitive data and can be used for evaluation of contaminant distribution and EAB performance. All data reported herein were appropriately qualified during data validation and are usable in accordance with the data usability assessment.

3.1 Evaluation Parameters and Criteria

To evaluate the effectiveness of EAB treatment, groundwater data were analyzed for the following parameters:

- PCE and its degradation products: TCE, cis-1,2-DCE, VC, ethene and ethane indicate the extent of contaminant degradation (including total molar concentrations of PCE and daughter products)
- TOC provides an indication of the longevity of the treatment prior to the need for additional amendment injection
- Groundwater oxidation-reduction indicators: DO, nitrate/nitrite, ferrous iron, sulfate, methane, and ORP demonstrate the transformation of groundwater geochemical conditions stimulated by the injected amendment and whether the conditions are favorable for EAB treatment
- pH and alkalinity are important for the growth of reductive dechlorination bacteria

Evaluation criteria for PCE and its degradation daughter products included the New Jersey Department of Environmental Protection Groundwater Quality Standards (NJGQS). The NJGQS for PCE, TCE and vinyl chloride are 1 µg/L and the NJGQS for cis-1,2-DCE is 70 µg/L. In addition, PCE concentrations were compared to the remediation goal of 50 µg/L and hot-spot treatment level concentration of 100 µg/L.

3.2 Analytical Results and Discussion

Results from the Round 4 sampling event and the evaluation of EAB treatment effectiveness are discussed separately for each area listed below:

- Facility Area
- Between the Facility Area and the Treatability Study Area
- Treatability Study Area

- Between the Treatability Study Area and the Biobarrier
- Biobarrier Area
- Areas Downgradient of the Biobarrier

For the overall evaluation of EAB treatment, data from the time of the treatability study and previous rounds are included in this report for the analysis of concentration trends.

3.2.1 Facility Area

During Round 4, groundwater samples were collected from four monitoring wells in the Facility Area: MW-31S, MW-31I, MW-29 and MW-30. These four wells were selected because contaminant concentrations exceeded the NJGQS in the 2012 sampling event (Round 2). Of these four wells, MW-31S and 31I are located upgradient of the injection points and MW-29 and MW-30 are located between two lines of injection points (Figure 1-2). During the Round 4 sampling event, PCE concentrations in these four wells remained greater than the NJGQS of 1 µg/L, however, the highest PCE concentration was 2.4 µg/L at MW-30. The Round 4 contaminant concentrations at these locations are presented along with the historical data in Table 3-1.

Comparison of Round 4 results with historical values shows the continued decreasing of contaminant concentrations in all four wells. The PCE concentrations at MW-29 decreased from 6.2 µg/L in Round 2 to 1.7 µg/L in Round 4; the PCE concentration at MW-30 decreased from 19 µg/L in Round 2 to 2.4 µg/L in Round 4. The concentrations of daughter products also generally showed similar decreasing trends at these two locations.

The TOC results in these four wells indicated that most of the amendment injected in the Facility area in 2007 has been consumed. Geochemical parameters show reducing conditions in MW-30, which indicates that anaerobic biodegradation may still be occurring in the vicinity of this location. Conditions in other areas do not appear to be conducive to anaerobic biodegradation. However, methane was detected in MW-29 and MW-30 at elevated concentrations. Methane is known to promote aerobic degradation of TCE, cis-DCE, and VC.

Overall, contaminant concentrations in the Facility area have decreased significantly over the years and current exceedances of the NJGQS are only sporadic and marginal.

3.2.2 Between the Facility Area and the Treatability Study Area

During Round 4, groundwater samples were collected from four monitoring wells between the Facility Area and the Treatability Study Area: MW-03I, MW-04I, MW-06I and MW-33I. These wells are located upgradient of the Treatability Study area and downgradient of Facility area. Contaminant concentrations at these wells are presented in Table 3-2a and the geochemical and wet chemistry parameters are presented in Table 3-2b. The results from these locations are discussed below.

3.2.2.1 Groundwater Geochemistry

Round 4 groundwater sample results indicated background groundwater geochemistry. At the four locations sampled, the groundwater pH levels were generally acidic ranging from 4.64 at MW-33I to

5.36 at MW-04I. The alkalinity values were low, the TOC concentrations were also low, and aerobic conditions were generally observed except for slightly reducing condition at MW-03I with an ORP value of -18.1 mV. The nitrate/nitrite and sulfate results during Round 4 were similar to the results from previous sampling events that showed presence of sulfate and nitrate/nitrite and did not show depletion. Ferrous iron was not analyzed at these locations. These results showed that conditions in this area generally did not favor natural anaerobic biodegradation of contaminants.

During Round 4, methane was detected at MW-03I and MW-04I in small amounts with 5.93 µg/L detected in MW-03I and 14.6 µg/L detected in MW-04I. However, at MW-33I where methane was previously detected during Round 2, there was no methane detected during Round 4. These results indicate that there may be minimal anaerobic degradation in some select locations in this area and the groundwater migrating from these locations could be impacting other wells. Overall, at locations between Treatability Study area and Facility Area, there is no evidence of any significant anaerobic biodegradation or conditions that are favorable for its occurrence (Tables 3-2a and 3-2b).

3.2.2.2 Contaminant Concentrations

In this area, site related contaminants PCE have previously been detected above NJGQS at MW-03I, MW-04I; MW-06I and at groundwater screening locations RA-GS-01 and RA-GS-05. TCE has been detected previously above NJGQS at MW-04I, RA-GS-01 and RA-GS-05.

During Round 4, TCE, cis-DCE, and VC did not exceed NJGQS. PCE exceeded NJGQS at MW-03I (8.4 µg/L) and MW-06I (5.7 µg/L). PCE concentrations in MW-03I fluctuated over time. PCE concentrations in MW-06I slightly increased compared to results from the RI.

PCE and TCE concentrations in MW-04I have shown consistent decreasing trends. This well is directly downgradient of the Facility Area. These decreasing trends are most likely the results of successful EAB treatment at the facility area.

The groundwater geochemistry at locations between the treatability study area and the facility area were generally under aerobic conditions. Nitrate/nitrite were detected at background concentrations. Methane was detected at trace concentrations in MW-03I and MW-04I during Round 4, which might be transported from the Facility Area by groundwater flow.

3.2.3 Treatability Study Area

Injections were performed in the Treatability Study Area in April 2007 and in October 2011 as listed in Section 1.5. During Round 4 16 wells were sampled at the Treatability Study Area. Analytical results and groundwater purging parameters for this area are presented in Table 3-3 and Figures 3-1, 3-2a, 3-2b, 3-2c and 3-2d.

3.2.3.1 Amendment distribution (TOC)

The distribution and longevity of the organic amendment, also referred as electron donor, is evaluated based on TOC results. Three years after the second amendment injection at MW-21I, MW-21S, and MW-23I, TOC results in these three wells were at or very close to baseline levels. TOC results were 1.6 mg/L and 1.2 mg/L in INJ-04 and INJ-05, respectively. TOC levels in the four shallow monitoring wells (MW-21S, MW-22S, MW-23S and MW-24S) ranged from 2.3 mg/L to 9 mg/L; in the intermediate wells

(MW-07I, MW-21I, MW-22I, MW-23I, MW-24I and MW-25I) ranged from 1.7 mg/L to 10 mg/L; and in the four deep wells (MW-21D, MW-22D, MW-23D and MW-24D) ranged from 1.2 mg/L to 28 mg/L.

All TOC concentrations were below 50 mg/L, indicating that most of the amendment has been consumed, which would lead to a slower rate of contaminant reduction.

3.2.3.2 Groundwater Geochemical Conditions

Results of groundwater geochemical parameters collected during the RA are summarized in Table 3-3. The pH value trends at each well from the time of the treatability study to Stage 2 RA Round 4 sampling event are presented in Figure 3-1.

pH and Alkalinity

Natural groundwater pH at this site is acidic and can be as low as 4.3, with values generally between 5 and 6. The natural alkalinity is also low, mostly less than 10 mg/L. During the treatability study, it was observed that the biological activities had increased the pH and alkalinity. This phenomenon was again observed after the second round of amendment injection at the Treatability Study Area as shown in Table 3-3 and Figure 3-1. However, during Round 4, three years after the second round of amendment injection, the pH in 15 of the 16 wells were at or below 6, except MW-7I; the alkalinity in 12 of the 16 wells also decreased from Round 3.

Even though the former Shaw Group Incorporated laboratory testing showed that reductive dechlorination would have some activity at a pH greater than 5.5, the bacteria were more active at a pH greater than 6.2. Therefore the decreases in pH and alkalinity are not favorable for the continuation of active EAB treatment, while some limited degradation may continue.

DO

The DO readings from 12 of the 16 wells in the treatability study area were below 1 mg/L during Round 4 sampling event, indicating that the entire area was generally under anoxic or anaerobic conditions, suitable for reductive dechlorination. The DO readings for MW-23D, MW-24D, and MW-24I were greater than 3 mg/L. These three wells had positive ORP readings and nitrate/nitrite was detected in MW-23D and MW-24D, indicating that these wells might start showing anoxic or aerobic conditions.

Nitrate/nitrite

Round 4 nitrate/nitrite concentrations ranged from non-detect (0.05 U mg/L) to 4.4 mg/L, most of the detections were at trace level. Nitrate/nitrite concentrations were non-detect in eight of the 16 wells that were sampled during Round 4. Nitrate/nitrite concentrations increased from Round 3 to Round 4 in most of the deep wells and remained stable in the intermediate wells. The slight increases of nitrate/nitrite likely indicate a slowdown of anaerobic biodegradation.

Ferrous Iron

Ferrous iron concentrations ranged from 4.4 mg/L to 47.7 mg/L. Ferrous iron concentrations significantly decreased from Round 3 to Round 4 in MW-21I, MW-22D and MW-23D. The decreases of ferrous iron concentrations indicated that biological activities were slowing down at those locations, therefore the biodegradation of PCE would also slow down. However, ferrous iron concentrations

were generally stable in the other wells, indicating that the subsurface remained under iron reducing conditions, suitable for reductive dechlorination.

Sulfate

The natural sulfate concentrations are low at the site, less than 10 mg/L. Sulfate concentrations at the Treatability Study Area during Round 4 were all non-detect, which is suitable for reductive dechlorination.

Methane

Methane was detected in all the wells that were sampled in this area during Round 4 at the Treatability Study Area. Methane concentrations ranged from 10,000 µg/L to 46,000 µg/L in wells, indicating that methanogenic conditions were maintained. Methane concentrations in two wells were significantly increased from Round 3 to Round 4 in MW-21D and MW-7I. This was preceded by significant decrease in methane concentrations between Round 2 and Round 3. This likely indicates migration of groundwater from areas of high methanogenic conditions locally.

ORP

ORP values ranged from -64.2 mV to 85.9 mV, indicating anaerobic to anoxic conditions. Iron reducing generally occurs below 50 mV. ORP readings showed significant decreases at MW-21D, MW-21S, MW-07I but these were likely local fluctuations due to groundwater migration. ORP at other locations were mostly stable or increasing indicating a gradual return to background conditions.

3.2.3.3 Contaminant Degradation

Contaminant concentration changes from Round 3 to Round 4 and the overall concentration trends are discussed below. The concentration trends are also presented in Figures 3-2a to 3-2d.

- Site-related VOC concentrations in the four injection wells have been reduced to low or trace level after the first amendment injection event. During Round 4, only PCE was detected at 2.1 µg/L, exceeding the NJGQS of 1 µg/L. Cis-1,2-DCE was above the NJGQS of 70 µg/L in Round 3, but decreased below NJGQS in Round 4. INJ-01 and INJ-02 were not analyzed during Round 4.

- Site-related VOC concentrations in the shallow zone (MW-21S to MW-24S) were all below NJGQS. The highest PCE concentration in the shallow zone was 0.51 µg/L detected at MW-23S, which had detections above NJGQS in previous rounds.

- Site-related VOC concentrations in the intermediate zone exceeded NJGQS except in MW-23I. PCE and TCE exceeded NJGQS at three wells: MW-22I, MW-25I and MW-07I; cis-1,2-DCE exceeded NJGQS at four wells: MW-21I, MW-22I, MW-24I and MW-25I; and vinyl chloride exceeded NJGQS at two wells: MW-21I and MW-24I. The highest PCE concentration was 150 µg/L at MW-25I. PCE concentrations in MW-22I and MW-07I decreased to below 50 µg/L from Round 3 to Round 4. Overall, the concentrations in all intermediate locations (except MW-25I) showed decreasing trends and were lower compared to previous rounds.

- Site-related VOC concentrations in the deep zone (MW-21D to MW-24D) remained lower in comparison to the levels in the intermediate wells. However, the PCE and TCE concentrations

were above the NJGQS in all the four wells with the highest concentration of PCE at 6.8 J µg/L and TCE at 1.8 µg/L detected in MW-23D.

- VC was detected at trace concentrations at selected wells and ethene was not detected in any of the monitoring wells. Although PCE is still present at significant levels, EAB treatment reduced PCE to cis-1,2-DCE at several locations. However, widespread detection of the daughter products of cis-1,2-DCE (VC, ethane and ethane) are not observed. This is indicative that the anaerobic biodegradation process may have stalled at cis-1,2-DCE.

Overall, three years after the second round of treatment, which targeted the intermediate zone and the shallow zone contamination at the Treatability Study Area, the highest PCE and TCE concentrations in the shallow zone has decreased from 65 µg/L and 20 µg/L, respectively, to 0.51 µg/L and non-detect, respectively. In the intermediate zone, PCE concentrations decreased but high concentrations still remain likely due to back diffusion from the adsorbed phase. PCE was converted to cis-1,2-DCE but further degradation may have stalled indicating the active EAB treatment has slowed down; and additional amendment injection is necessary.

3.2.4 Between the Treatability Study Area and the Biobarrier Area

The Round 4 results are provided in Table 3-4 with the Baseline sampling round through Round 3. The table shows results for wells MW-36 and MW-39 located between the Treatability Study Area and the Biobarrier. Well MW-36 is located approximately 600 feet downgradient from the Treatability Study Area; MW-39 is located about 500 feet downgradient of MW-36, and approximately 50 feet upgradient of the line of injection wells at the Biobarrier Area.

3.2.4.1 TOC

The TOC results in MW-36 and MW-39 were non-detect and 1.1 mg/L, respectively. This trace level of organics cannot promote EAB treatment. This is consistent with the data from previous rounds and showed that the amendment injected at the Treatability Study Area was consumed within a short distance from the injection locations and did not migrate to this area.

3.2.4.2 Groundwater Geochemical Conditions

Groundwater geochemical data from both wells indicated minimal impact from the Treatability Study Area: the DO readings were low indicating anoxic conditions, nitrate/nitrite were at the background level; ferrous iron concentrations were non-detect; sulfate concentrations were also at the background level. Methane concentrations showed an increasing trend in both wells which were the results of groundwater migration from the Treatability Study Area. It should be noted that the low DO readings are consistent with the detection of methane in MW-36 and MW-39. If the groundwater is under highly aerobic conditions, methane would be oxidized to carbon dioxide and might not be detected in these wells 600 or more feet downgradient. The ORP values were high with 232.6 mV at MW-36 and 194.6 mV at MW-39, indicating anoxic conditions. The pH values were generally acidic with 4.69 at MW-36 and 5.03 at MW-39. The alkalinity results were less than 5 mg/L, similar to the low pH and low alkalinity background groundwater geochemistry.

3.2.4.3 Contaminant Degradation

Both PCE and TCE concentrations exceeded the NJGQS in MW-36 and MW-39. The PCE concentration in MW-36 was 34 µg/L during the Baseline event and increased to more than 100 µg/L during Rounds 1 to 3 and decreased to 92 µg/L in Round 4. The PCE concentrations in MW-39 fluctuated between 59 µg/L and 100 µg/L from Baseline to Round 4. TCE concentrations were generally stable in both wells. Cis-1,2-DCE concentrations were below the NJGQS value of 70 µg/L in all sampling rounds. VC was not detected in any of the sampling events. It is worth noting that the elevated cis-1,2-DCE observed in previous rounds at the Treatability Study Area was not observed at these two locations.

3.2.5 Biobarrier Area

The results of Round 4 sampling, along with the results of Baseline, Round 1, Round 2, and Round 3 sampling events are presented in Table 3-4 and Figures 3-3a and 3-3b. The 50 µg/L PCE plume appeared to bifurcate at the Biobarrier Area (Figure 3-7 in Appendix A); therefore, the northern and southern portions of the biobarrier are discussed separately.

3.2.5.1 Amendment Distribution (TOC)

At the northern portion of the Biobarrier Area, TOC results in INJ-14 and INJ-15 within the Biobarrier were 110 mg/L and 60 mg/L respectively during Round 4 and remained elevated and suitable for active EAB treatment three years after amendment injection. Amendment was not adequately distributed to MW-40, located at the midpoint between two injection wells. The TOC concentration was non-detect before Round 3 and was at trace level during Round 3 and Round 4. The TOC results in other monitoring wells MW-41 to MW-43 ranged from 1.1 mg/L to 7.1 mg/L, lower than needed for active EAB treatment but the TOC level in MW-47 jumped from 3.7 mg/L in Round 3 to 56 mg/L during Round 4. The TOC level in MW-48 dropped from 32 mg/L in Round 3 to 1.5 mg/L in Round 4. These TOC concentration changes indicate redistribution of amendment due to migration with groundwater.

At the southern portion of the Biobarrier Area, TOC results were non-detect in MW-44, MW-45 and MW-46. TOC was detected at a trace level of 1.1 mg/L in MW-34I. TOC was only detected at trace levels in these four wells from Round 1 to Round 4, even though the chemical oxygen demand result in MW-44 was 650 mg/L at the end of amendment injection. It is possible that the wells are screened in the sandy formation, which has low retention capacity for emulsified vegetable oil (EVO). The low organic content at this portion of the Biobarrier Area cannot promote EAB treatment.

3.2.5.2 Groundwater Geochemical Conditions

The results from the Round 4 sampling event along with the trends from the Baseline to Round 4 are discussed below to determine whether the geochemical conditions were suitable for EAB treatment.

pH and Alkalinity

The pH values recorded during the Round 4 sampling event at the Biobarrier Area ranged from 4.22 to 6.67. The pH values in 8 of the 12 wells at the depth of the treatment zone were below 5.5, the same as the background level. At the northern portion of the Biobarrier Area, the pH in INJ-15 and MW-41 stabilized at 6. The pH actually increased to 6 and above at MW-42, MW-47, and MW-48 which were likely due to migration of EAB treated groundwater. Overall, the low pH readings were not favorable for EAB treatment.

The alkalinity values in the two injection wells, INJ-14 and INJ-15, and three monitoring wells, MW-42, MW-47 and MW-48 were elevated due to biological activities. Alkalinity results in all other wells were low, consistent with the low groundwater pH values.

DO

During Round 4, at the northern portion of the Biobarrier Area, the DO readings of all eight wells were less than 1 mg/L, indicating anaerobic and anoxic conditions. At the southern portion of the Biobarrier Area, the DO readings ranged from 2.44 to 4.23 mg/L, indicating aerobic conditions.

Nitrate/nitrite

Nitrate/nitrite concentrations from Round 4 samples at the northern Biobarrier Area were non-detect in the two injection wells and ranged from 0.20 mg/L to 2.3 mg/L in the monitoring wells. These relatively low nitrate/nitrite concentrations indicated possible nitrate reducing conditions. At the southern Biobarrier Area, nitrate/nitrite concentration ranged from 3.7 mg/L to 8.4 mg/L, similar to the background level and consistent with the aerobic conditions at this area.

Ferrous Iron

During Round 4, at the northern Biobarrier Area, ferrous iron concentrations in INJ-14 and INJ-15 were 54.6 mg/L and 45.4 mg/L respectively, indicating iron reducing conditions. Ferrous iron concentrations in four of the six monitoring wells were greater than 5 mg/L, except MW-40 and MW-43, also indicating iron reducing conditions. At the southern Biobarrier Area, ferrous iron ranged from non-detect to 0.98 mg/L. The lack of ferrous iron was consistent with the aerobic conditions at this area.

Sulfate

Sulfate was depleted in the two injection wells, INJ-14 and INJ-15, and three of six monitoring wells, MW-42, MW-43 and MW-47, at the northern Biobarrier Area, indicating that sulfate reductions at localized areas. Sulfate was non-detect in three of the four wells at the southern portion of the Biobarrier Area, which is most likely due to the low natural sulfate concentration in the sandy formation.

Methane

Methane concentrations in the two injection wells INJ-14 and INJ-15 were 28,100 µg/L and 27,700 µg/L respectively, indicating methanogenic conditions. Methane concentrations ranged from 73.5 µg/L to 7,940 µg/L in the six monitoring wells at the northern portion of the Biobarrier Area, which might be generated locally or was transported to these wells by groundwater flow. Methane was detected at trace levels of 12.7 µg/L in MW-34I and 4.53 µg/L in MW-46 but was non-detect in the other two monitoring wells at the southern portion of the Biobarrier Area. This is consistent with the aerobic conditions at this area.

ORP

During Round 4 at the northern portion of the Biobarrier Area, the ORP readings in three of the six wells were less than 50 mV, indicating anaerobic and anoxic conditions. At the southern portion of the Biobarrier Area, the ORP ranged from 238.7 mV to 290.5 mV, indicating aerobic conditions. The ORP readings were consistent with the nitrate/nitrite, ferrous iron, and methane concentrations detected

in the Biobarrier Area, which indicated that the northern portion remained somewhat amenable to EAB treatment but the southern portion was not.

3.2.5.3 Contaminant Degradation

Contaminant concentration changes are presented in Table 3-4 and Figures 3-3a and 3-3b. Note that 12 of the 14 wells presented in Table 3-4 are located within the EAB treatment zone. MW-12I and MW-34D are screened deeper than the EAB treatment zone, and there were no signs of impact in these two wells from the amendment injection. The key observations based on data from wells within the depth of EAB treatment zone are listed below:

- Biodegradation of PCE continued in INJ-14 and MW-42, as evidenced by the increase of cis-1,2-DCE and decrease of PCE and TCE.
- Biodegradation of PCE in INJ-15 was limited even with the presence of sufficient organics and reasonable conditions for anaerobic biodegradation, which might be due to back diffusion from the adsorbed phase as well as migration of contaminants from upgradient.
- PCE concentrations in MW-42, MW-43 and MW-47 at the northern portion of the Biobarrier Area and MW-34I and MW-44 at the southern portion of the Biobarrier decreased approximately 50% or more compared to the baseline round, even though increase of cis-1,2-DCE as intermediate or detection of ethene as daughter product were not observed. Since it appears that some anaerobic biodegradation is on-going at the northern portion of the Biobarrier Area, the decrease in PCE concentration is likely due to biodegradation. However, the southern portion of Biobarrier Area is under aerobic conditions, it is unclear if this PCE concentration decrease is permanent or if it may rebound when PCE at higher concentrations from upgradient area migrates to this area.
- During Round 4, PCE concentrations in five of the eight wells at the northern portion of the Biobarrier Area were above 50 µg/L; one of the four wells at the southern portion of the Biobarrier Area was above 50 µg/L.
- PCE concentrations in all 12 wells were above the NJGQS of 1 µg/L and TCE concentrations in 11 of the 12 wells were above the NJGQS of 1 µg/L.

It should be noted that the Biobarrier Area is located at the downgradient portion of the 50 µg/L PCE plume. As the organics being consumed and contaminants at elevated concentrations flow into this area, contaminant concentrations in wells with 50% removal might increase.

3.2.6 Downgradient of Biobarrier Area

Downgradient of the Biobarrier, monitoring wells MW-37, MW-38S, -I, -D, MW-11I, -D and MW-35S, -I,- D were sampled during Round 4. The suffixes S, I and D indicate that the well screens for the sample interval are within shallow, intermediate and deep aquifer zones respectively. The corresponding screen depths and the results at these locations are presented in Table 3-5a and Table 3-5b. Table 3-5a presents the concentrations of site-related contaminants and Table 3-5b presents the geochemical and wet chemistry parameters. The results are discussed in detail in the sections below.

3.2.6.1 Groundwater Geochemical Conditions

The results from Round 4 were consistent with previous rounds indicating natural aerobic conditions. ORP readings were positive and greater than 150 mV at all locations. DO readings were generally greater than 1 mg/L at all locations. Nitrate/nitrite was detected at all locations at background level. Ferrous iron concentrations were non-detect or at trace levels. (No concentrations were determined at wells MW-35S, -I and -D). Sulfate concentrations were also at background level. Methane was non-detect at all locations except MW-11I where the concentration was very low (2.12 µg/L).

The pH readings were below 5 at all locations downgradient of the Biobarrier, showing acidic conditions. The alkalinity was also low except at MW-35D. The high alkalinity value in MW-35D (estimated value of 100 mg/L) was inconsistent with previous rounds and is considered an outlier. The TOC results were generally non-detects or at low concentrations with the highest value of 4.1 mg/L in MW-38I.

Overall, the results confirm the observations from previous rounds that there are no distinct signs of groundwater geochemical changes at these downgradient locations from the EAB treatment at the Biobarrier Area.

3.2.6.2 Contaminant Degradation

PCE concentrations remained lower than 50 µg/L at all downgradient locations during Round 4 but exceeded the NJGQS at MW-37, MW-38D, MW-35S and MW-35I. The concentration at MW-37, MW-38D, MW-35S and MW-35I were respectively 18 µg/L, 21 µg/L, 1.1 µg/L and 13 µg/L. Comparing the results from Baseline to Round 4, PCE concentrations in MW-37, MW-38D, and MW-35I were generally stable. At locations MW-38I, MW-11I, and MW-11D, where concentrations exceeded the NJGQS in previous rounds, the concentrations during Round 4 were below NJGQS. The concentrations at MW-38I, MW-11I and MW-11D were 0.24J µg/L, 0.24 J µg/L and 0.29 J µg/L respectively. The PCE concentration at MW-35D was non-detect.

TCE concentrations exceeded the NJGQS at MW-37, MW-38D and MW-35I. The results at these locations were 1.8 µg/L, 1.2 µg/L and 1.2 µg/L respectively. TCE was also detected at MW-11D and MW-35S at 0.11 µg/L and 0.11 µg/L respectively. TCE results were non-detects at MW-38I, MW-11I and MW-35D. The detected results showed generally stable to decreasing trends during Round 4 compared to results from previous sampling rounds.

Cis-1,2-DCE was also detected at levels well below the NJGQS at MW-37, MW-38D, MW-11I, MW-11D, MW-35S and MW-35I. The highest detected result for the compound during Round 4 was observed at MW-37 at 1.5 µg/L. There were no vinyl chloride detections during Round 4 at locations downgradient of the Biobarrier.

Overall, the contaminant concentrations appear to be stable or decreasing. At location MW-38D, the contaminant trend appeared to increase slightly during Round 4. This could be due to fluctuations caused by natural variation in contaminant migration.

3.3 Evaluation of Biological Results

For the evaluation of EAB treatment and the potential of natural attenuation of site contaminants, the bacterial population capable of degrading site contaminants under both aerobic and anaerobic conditions was also investigated. Groundwater samples were collected from six monitoring wells located throughout the contaminant plume for QuantArray analysis. These six wells are: MW-30, MW-4I, MW-7I, MW-36, MW-37, and MW-47. QuantArray analysis provides quantitative data for the evaluation of biodegradation of site contaminants through a multitude of anaerobic and aerobic (co)metabolic pathways. The QuantArray results are presented in Table 3-6. The complete QuantArray laboratory report is provided in Appendix E. It is worth noting that 10^4 cell per milliliter is considered a healthy population for biodegradation to occur.

First, the total eubacteria represent the population of bacteria commonly present in the environment and the sulfate reducing bacteria represent the bacteria working in an environment to reduce chemicals and organics such as sulfate, iron, and nitrate/nitrite. The results of these two groups of bacteria demonstrate that the biological activities are much more active in areas with EAB treatment, such as in MW-30, MW-7I, and MW-47, than in areas without EAB treatment, such as in MW-37.

Second, many bacteria can degrade PCE and TCE to DCE, while only *dehalococcoides spp.* (DHC) is found to be capable to degrade PCE and TCE to ethene. Results of samples showed very low levels of DHC and its functional genes are present in MW-7I and MW-47. This is consistent with the increase of cis-DCE observed in the EAB treatment zones. The low level of DHC and its functional genes could also be related to the relative low site contaminant concentrations and low pH, which are not favorable to the growth of DHC. The population of other anaerobic bacteria, such as *dehalobacter spp.* *dehalogenimonas spp.*, and *desulfitobacterium spp.* were also elevated in the EAB treatment areas compared to locations outside EAB treatment zone.

Third, aerobic bacteria, such as soluble methane monooxygenase, are ubiquitous and found to be able to degrade TCE, DCE, and vinyl chloride through cometabolic pathways. Methane generated by EAB treatment can potentially stimulate aerobic cometabolic degradation with the presence of even trace amount of oxygen. The results showed decent population of aerobic cometabolic bacteria in MW-4I, MW-30, and MW-7I, indicating active aerobic biological activities within areas with or impacted by EAB treatment. PCE could not be degraded under aerobic conditions. The presence of aerobic bacteria for cometabolic degradation of site contaminants might explain the fact that accumulation of cis-1,2-DCE was not observed in wells downgradient of EAB treatment areas.

Finally, the QuantArray results showed lack of biological activities in MW-37, the area downgradient of the Biobarrier Area. These results confirmed that the mechanisms for natural attenuation of site contaminants outside the EAB treatment zones would mainly be dilution and dispersion.

This page is intentionally left blank.

Section 4

Conclusions and Recommendations

This section summarizes the findings and provides recommendations for path forward of Stage 2 RA.

4.1 Conclusions

The key findings of the Round 4 sampling event are summarized below:

- Overall, EAB treatment at the Facility Area, the Treatability Study Area and the Biobarrier Area has decreased contaminant concentrations and reduced contaminant mass.
- EAB remained active at localized areas within the Treatability Study Area and the northern portion of the Biobarrier Area where the organics remained. Meanwhile, contaminant concentrations have increased in selected wells at both treatment areas due to lack of organic carbon and the rate of remediation has slowed.
- The Round 4 results show that PCE levels remained greater than 50 µg/L (the target treatment concentration) from the Treatability Study Area to the Biobarrier Area. Results from Stage 1 groundwater screening indicated that the 50 µg/L PCE plume extended both upgradient of the Treatability Study Area and downgradient of the Biobarrier Area (CDM Smith 2011a). Figure 4-1 depicts the estimated PCE plume based on the Round 4 results in combination with the Stage 1 groundwater screening results. Back diffusion of VOCs from the fine-grained aquifer unit may contribute to the sustained 50 µg/L PCE levels and the overall contaminant plume.
- Additional amendment injection would be necessary to continue the active EAB treatment.

4.2 Recommendations

Recommendations for the path forward for this site are provided below.

4.2.1 Installation of Monitoring Wells

As shown in Figure 4-1, six monitoring wells are proposed to define the boundary of the contaminant plume. The proposed screen intervals are provided in Table 4-1. In order to determine the location for MW-54, up to two groundwater screening borings will be installed. The first boring location will be in the vicinity of MW-54 shown in Figure 4-1. If contaminant concentrations in this well are greater than the NJGQS, a second boring further downgradient may be installed to define the downgradient boundary of the contaminant plume subject to availability of access. It should be noted that these new monitoring wells would also be used in application of classification exception area (CEA) as part of the long-term monitoring program.

4.2.2 Classification Exception Area

The remedial strategy selected for the contaminant plume outside the 50 µg/L PCE plume is long-term monitoring and establishment of a CEA. The CEA will restrict the use of contaminated groundwater

until the groundwater quality reaches the NJGQS. There are three fundamental elements of a CEA as listed below:

- CEA boundaries: the current and projected boundaries of the contaminant plume
- Site contaminants
- Longevity of the contaminant plume

The four monitoring wells (MW-49, MW-52, MW-53, and MW-54) to be installed will provide a better plume boundary than existing monitoring wells. Routine groundwater sample collection from a site-wide monitoring network is necessary to demonstrate that the plume is within the CEA area and the contaminant concentration in a decreasing trend at the plume fringe. Furthermore, in order to predict the longevity of the plume, the existing groundwater model needs to be updated. The updated groundwater model will be used to predict the extent of the contaminant plume migration over time and the longevity of the contaminant plume after the active treatments are completed.

EPA will need to determine the timing of the CEA application.

4.2.3 Hot Spot Treatment

Based on the past performance of EAB treatment and site-specific conditions, CDM Smith recommends conducting hot spot treatment at areas with PCE concentrations greater than 100 µg/L. CDM Smith believes that hot spot treatment is a cost-effective approach to reduce contaminant mass. The sample locations with PCE concentrations greater than 100 µg/L are presented in Figure 4-2. Data from the stage 2 Round 4 groundwater sampling as well as Stage 1 RA groundwater screening are provided. At the Treatability Study Area, review of available lithologic (Appendix F) and analytical data indicates that the contaminant plume might extend to the north around RA-GS-14 and to the south around RA-GS-30 laterally, and within approximately 10 feet above and into the clay lenses vertically.

In order to further delineate the 100 µg/L PCE plume for hot spot treatment, CDM Smith proposes to collect groundwater screening samples at two areas as shown in Figure 4-2. Six groundwater screening borings and two lithologic borings would be advanced between the proposed monitoring wells MW-50 and MW-51 to update the contaminant distribution in the Treatability Study Area and in the vicinity of MW-36. Locations will be adjusted in the field based on accessibility. The target intervals for groundwater screening samples are shown in Table 4-2.

In addition to contaminant distribution, the hot spot treatment would also be conducted based on site access. CDM Smith envisions that the hot spot treatment will be at the Treatability Study Area for the following reasons:

- The Treatability Study Area has high concentrations of PCE. Treatment of this area could result in higher contaminant mass removal.
- The Treatability Study Area is at the upgradient portion of the 100 µg/L PCE plume; remediating this area would result in less contaminant loading to the downgradient areas.

Also, it is less likely that this area would be re-contaminated after treatment from an upgradient source.

Hot spot treatment might also be conducted in the vicinity of MW-41 and INJ-15 where PCE greater than 100 µg/L was observed.

Detailed hot spot treatment approach including, injection locations, injection method, injection point spacing, and quantity and concentration of EVO would be determined after the results of the groundwater screening samples become available. The following modifications to the previous practice at this site are being considered for EVO delivery:

- Using a direct push technology rig with a 5-foot injection screen to perform the amendment injection to reduce costs compared to well installation and abandonment
- Using a higher concentration of EVO (2-3% by volume) to (1) increase the quantity that can be retained by soil in the treatment zone and/or (2) promote a larger treatment zone in the downgradient direction (as the injected solution migrates downgradient with groundwater flow)
- Adding bicarbonate to the EVO solution to temporarily raise the groundwater pH and expedite the initial startup and stimulation of EAB treatment

This page is intentionally left blank.

Section 5
References

CDM Federal Program Corporation. (CDM Smith). 2011a. Final Stage 1 Remedial Action Technical Memorandum. Iceland Coin Laundry Superfund Site, Remedial Action, Vineland, New Jersey. August 18.

_____. 2011b. Final Quality Assurance Project Plan Addendum. Iceland Coin Laundry Site, Vineland, Cumberland County, New Jersey. June 17.

_____. 2012. Stage 2 Remedial Action – Round 1 Performance Evaluation Report. Iceland Coin Laundry Superfund Site, Vineland, New Jersey. August 29.

_____. 2013. Stage 2 Remedial Action – Round 2 Performance Evaluation Draft Report. Iceland Coin Laundry Superfund Site, Vineland, New Jersey. February 28.

_____. 2014. Stage 2 Remedial Action – Round 3 Performance Evaluation Draft Report. Iceland Coin Laundry Superfund Site, Vineland, New Jersey. July 24.

United States Environmental Protection Agency (EPA). 2006. EPA Superfund Record of Decision: Iceland Coin Laundry Area GW Plume, EPA ID: NJ0001360882, OU 01, Vineland, NJ. September 27.

This page is intentionally left blank.

Tables

Table 2-1
Round 4 Sampling and Analysis Summary
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Well ID	Well Diameter (inches)	Screened Interval (feet bgs)	Sample ID	Sampling Date	Laboratory Analysis								Field Analysis
					VOC-trace	VOC-low	MEE	TOC	Nitrate/Nitrite	Sulfate	Alkalinity	QuantArray	Ferrous Iron
MW-29	2	22 - 27	MW-29-R4-RA2	10/28/2014	1		1	1	1	1	1		
MW-30	2	22 - 27	MW-30-R4-RA2	10/28/2014	1		1	1	1	1	1	1	
MW-31S	2	13 - 18	MW-31S-R4-RA2	10/27/2014	1		1	1	1	1	1		
MW-31I	2	22 - 27	MW-31I-R4-RA2	10/27/2014	1		1	1	1	1	1		
MW-03I	4	45.7 - 55.7	MW-03I-R4-RA2	10/27/2014	1		1	1	1	1	1		
MW-04I	4	43.9 - 53.9	MW-04I-R4-RA2	10/29/2014	1		1	1	1	1	1	1	
MW-06I	4	69.9 - 79.9	MW-06I-R4-RA2	11/3/2014	1		1	1	1	1	1		
MW-33I	4	63 - 73	MW-33I-R4-RA2	10/27/2014	1		1	1	1	1	1		
INJ-04	4	65 - 95	INJ-04-R4-RA2	10/29/2014	1		1	1	1	1	1		1
INJ-05	4	65 - 95	INJ-05-R4-RA2	10/29/2014	1		1	1	1	1	1		1
MW-07I	4	74.3 - 84.3	MW-07I-R4-RA2	10/28/2014		1	1	1	1	1	1	1	1
MW-21D	2	85 - 95	MW-21D-R4-RA2	10/29/2014		1	1	1	1	1	1		1
MW-21I	2	75 - 85	MW-21I-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-21S	2	65 -75	MW-21S-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-22D	2	85 - 95	MW-22D-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-22I	2	75 - 85	MW-22I-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-22I	2	75 - 85	MW-922I-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-22S	2	65 - 75	MW-22S-R4-RA2	10/29/2014		1	1	1	1	1	1		1
MW-23D	2	85 - 95	MW-23D-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-23I	2	75 - 85	MW-23I-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-23S	2	65 - 75	MW-23S-R4-RA2	10/29/2014		1	1	1	1	1	1		1
MW-24D	2	85 - 95	MW-24D-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-24I	2	75 - 85	MW-24I-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-24S	2	65 - 75	MW-24S-R4-RA2	10/28/2014		1	1	1	1	1	1		1
MW-25I	2	75 - 85	MW-25I-R4-RA2	10/27/2014		1	1	1	1	1	1		1
MW-36	4	92-102	MW-36-R4-RA2	10/29/2014		1	1	1	1	1	1	1	1
INJ-14	4	76-86	INJ-14-R4-RA2	10/31/2014		1	1	1	1	1	1		1
INJ-15	4	76-86	INJ-15-R4-RA2	10/31/2014		1	1	1	1	1	1		1
MW-39	4	76-86	MW-39-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-40	4	75-85	MW-40-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-41	4	75-85	MW-41-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-42	4	77-82	MW-42-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-43	4	77-82	MW-43-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-47	4	77-82	MW-47-R4-RA2	10/29/2014		1	1	1	1	1	1	1	1

Table 2-1
Round 4 Sampling and Analysis Summary
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Well ID	Well Diameter (inches)	Screened Interval (feet bgs)	Sample ID	Sampling Date	Laboratory Analysis								Field Analysis
					VOC-trace	VOC-low	MEE	TOC	Nitrate/Nitrite	Sulfate	Alkalinity	QuantArray	Ferrous Iron
MW-48	4	90-100	MW-48-R4-RA2	10/29/2014		1	1	1	1	1	1		1
MW-12I	4	100 - 110	MW-12I-R4-RA2	10/30/2014	1		1	1	1	1	1		1
MW-34D	4	98 - 108	MW-34D-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-34I	4	78 - 88	MW-34I-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-44	4	78-88	MW-44-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-45	4	78-88	MW-45-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-45	4	78-88	MW-945-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-46	4	78-88	MW-46-R4-RA2	10/30/2014		1	1	1	1	1	1		1
MW-37	4	76-86	MW-37-R4-RA2	10/30/2014	1		1	1	1	1	1	1	1
MW-38I	2	72-82	MW-38I-R4-RA2	10/31/2014	1		1	1	1	1	1		
MW-38D	2	106-116	MW-38D-R4-RA2	10/31/2014	1		1	1	1	1	1		
MW-11I	4	99.1 - 109.1	MW-11I-R4-RA2	10/31/2014	1		1	1	1	1	1		
MW-11D	4	128.7 - 138.7	MW-11D-R4-RA2	10/31/2014	1		1	1	1	1	1		
MW-35S	4	60 - 70	MW-35S-R4-RA2	11/3/2014	1		1	1	1	1	1		
MW-35I	4	90 - 100	MW-35I-R4-RA2	11/3/2014	1		1	1	1	1	1		
MW-35I	4	90 - 100	MW-935I-R4-RA2	11/3/2014	1		1	1	1	1	1		
MW-35D	4	120 - 130	MW-35D-R4-RA2	11/3/2014	1		1	1	1	1	1		
			FB-102714	10/27/2014	1		1						
			FB-102814	10/28/2014	1		1						
			FB-102914	10/29/2014	1		1						
			FB-103014	10/30/2014	1		1						
			FB-103114	10/31/2014	1		1						
			FB-110314	11/3/2014	1		1						
			TB-102714	10/27/2014	1		1						
			TB-102814	10/28/2014	1		1						
			TB-102914	10/29/2014	1		1						
			TB-103014	10/30/2014	1		1						
			TB-103114	10/31/2014	1		1						
			TB-110314	11/3/2014	1		1						
Totals					32	31	63	51	51	51	51	6	35

Notes:
ID - identification
VOC - volatile organic compound
I - intermediate
S - shallow
MEE - methane, ethane, ethene
1 - sample to be analyzed
D - deep

Table 3-1
Groundwater Sample Results at the Facility Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Sample ID	Sampling Date	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	VC	Alkalinity	TOC	Nitrate/ Nitrite	Fe 2+	Sulfate	Methane	Ethane	Ethene	pH	DO	ORP
		µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	std units	mg/L	mV
Upgradient of injection points																	
MW-31S-R7	4/14/2009	**35**	0.5 U	0.5 U	0.5 U	0.5 UJ	1.7	1.3	3.8	0.04	10 K	4.5 J	10 U	10 U	4.63	1.09	290.3
MW31S-B-RA2	8/30/2011	**2.7**	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	3.4	0.03 U	10	2 U	2 U	2 U	4.61	4.98	155.7
MW-31S-R2-RA2	12/5/2012	**4.5**	0.5 U	0.5 U	0.5 U	0.5 U	1 U	2	2.7	0.13	18	77.2	2 U	2 U	4.38	0.71	358.6
MW-31S-R4-RA2	10/27/2014	**2.2**	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1.9	6.8	NA	27	13.3	2 U	2 U	4.21	0.41	256.9
MW-31I-R7	4/14/2009	**34**	**2.3**	1.6	0.5 U	0.5 UJ	3.5	1.3	3.3	0.04	39 J	6.6 J	10 U	10 U	4.74	0.06	-227.3
MW31I-B-RA2	8/30/2011	**15**	**2.6**	1.5	0.5 U	0.5 U	2.7	2.1	4.1	0.24	35	3.4	2 U	2 U	4.58	3.67	151.5
MW-31I-R2-RA2	12/5/2012	**5.1**	**1.3**	0.72	0.5 U	0.5 U	7.8	2.5	1.9	0.07	49	6.93	2 U	2 U	4.66	0.44	281.3
MW-31I-R4-RA2	10/27/2014	**1.1**	0.38 J	0.26 J	0.5 U	0.5 U	2.8	1.5	2.9	NA	28	5.03	2 U	2 U	4.61	0.29	199.1
First line of injection points																	
INJ-09-R7	4/15/2009	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	15	3.3	0.12	0.03	5 U	720	10 U	10 U	6.95	3.56	122.7
INJ09-B-RA2	8/30/2011	0.5 U	0.5 U	1.4	0.5 U	0.5 U	180	7	0.05 U	93.2	1 U	24,000	2 U	2 U	6.24	3.32	-71.4
INJ-10-R7	4/14/2009	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	84	26	0.1 UJ	12.2	50 UJ	17,000	1,000 U	1,000 U	6.36	1.6	-8.3
INJ10-B-RA2	8/30/2011	0.5 U	0.5 U	14	0.5 U	0.2 J	310	12	0.05 U	62	1 U	13,000	2 U	2 U	6.32	0.54	133.9
Between two lines of injection points																	
MW-29-R7	4/15/2009	**39**	**1.9**	1.9	0.5 U	0.5 U	18	1.7	3.3	0.07	20 K	10 U	10 U	10 U	5.34	0.62	270.8
MW29-B-RA2	8/29/2011	**3.3**	0.5 U	0.23 J	0.5 U	0.5 U	24	1.7	3.4	0.03 U	22	71	2 U	2 U	5.37	2.46	162.3
MW-29-R2-RA2	12/5/2012	**6.2**	0.5 U	2.7	0.5 U	0.5 U	16	2.3	2.2	0.03 U	20	1,250	2 U	2 U	5.3	1.02	270.3
MW-29-R4-RA2	10/28/2014	**1.7**	0.12 J	1	0.5 U	0.5 U	28	1.5	2.4	NA	22	1,630	2 U	2 U	5.52	1.35	217.4
MW-30-R7	4/14/2009	**29**	**1.5**	3.9	0.5 U	0.5 UJ	180	3.6	0.34	7.4	50 UJ	81	10 U	10 U	6.65	0.66	-110.5
MW30-B-RA2	8/29/2011	**16**	**3.7**	6.6	0.5 U	0.5 U	110	2.9	0.087	6.32	26	4,800	2 U	2 U	6.43	1.29	-163.7
MW-30-R2-RA2	12/6/2012	**19**	**3.2**	1.3	0.5 U	0.5 U	90	2.4	0.43	76.8	22	357	2 U	2 U	6.32	0.26	-54.9
MW-30-R4-RA2	10/28/2014	**2.4**	0.71	0.43 J	0.5 U	0.5 U	75	2.6	0.44	NA	29	6670	2 U	2 U	5.79	0.1	-7.9
Second line of injection points																	
INJ-06-R7	4/15/2009	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	43	3.5	0.1 UJ	25.5	5.7 K	17,000	1,000 U	1,000 U	5.91	0.51	-65.7
INJ06-B-RA2	8/30/2011	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	64	2.3	0.05 U	22.8	6.7	24,000	2 U	2 U	6.33	0.25	-78.1
INJ-07-R7	4/15/2009	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	120	8.3	0.5 UJ	64	25 U	22,000	1,000 U	1,000 U	6.49	0.17	-101.6
INJ07-B-RA2	8/30/2011	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	69	3.9	0.05 U	41.2	1 U	13,000	2 U	2 U	6.5	0.27	-116.8
INJ-08-R7	4/15/2009	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	100	5.8	0.5 UJ	65.56	50 UJ	21,000	1,000 U	1,000 U	6.4	0	-169.7
INJ08-B-RA2	8/30/2011	0.5 U	0.5 U	0.12 J	0.5 U	0.5 U	100	3.9	0.05 U	41	7.3	16,000	2 U	2 U	6.57	0.3	-98.3
Downgradient of the second line of injection points																	
MW-26-R7	4/15/2009	**2**	0.5 U	0.6	0.5 U	0.5 U	50	2.4	0.1 UJ	17.7	100 U	7,300	100 U	100 U	5.77	0.12	-36
MW26-B-RA2	8/29/2011	**1.3**	0.31 J	0.83	0.5 U	0.5 U	61	2.5	0.05 U	14.2	7.8	4,700	2 U	2 U	6.14	0.5	-98.8
MW-26-R2-RA2	12/5/2012	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	130	3.8	0.05 U	59.4	10	3,980	2 U	2 U	6.48	0.31	-96.1
MW-28-R7	4/15/2009	0.5 U	0.5 U	37	0.5 U	0.5 U	110	18	0.5 UJ	65.8	50 UJ	22,000	500 U	500 U	6.42	0	-126.4
MW28-B-RA2	8/29/2011	**1.9**	**1.4**	4.4	0.5 U	0.5 U	67	2.6	0.05 U	46.8	17	17,000	2 U	2 U	6.18	2.33	-51
MW-28-R2-RA2	12/5/2012	0.5 U	0.5 U	1.2	0.5 U	0.5 U	140	2.8	0.05 U	102	15	21,400	2 U	2 U	6.16	0.22	-29.6
Side gradient of the injection points																	
MW-02S-R7	4/7/2009	**10**	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW02S-B-R2	8/29/2011	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	25	3.4	5.8	0.03 U	7.5	2.2	2 U	2 U	5.5	3.03	132.5
MW-02I-R7	4/7/2009	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW02I-B-RA2	8/29/2011	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	39	4.8	0.24	0.03 U	2.5	2.8 K	2 U	2 U	6.55	7.51	115.3

Notes:

ID - identification
PCE - tetrachloroethene
TCE - trichloroethene
DCE - dichloroethene
VC - vinyl chloride
TOC - total organic carbon
Fe 2+ - ferrous iron
DO - dissolved oxygen
ORP - oxidation-reduction potential
µg/L - microgram per liter
mg/L - milligram per liter
std - standard
mV - millivolt
U - non-detect
J - estimated results
K - results are biased high
NA - not analyzed

Highlighted and bold results exceed the 1 µg/L New Jersey Groundwater Quality Standard for PCE and TCE.

Table 3-2a
Groundwater VOC Results between the Facility Area and the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Location	Sample Code	Sample Interval (feet bgs)	Sample Date	PCE		TCE		cis-1,2-DCE		Vinyl Chloride	
				µg/L		µg/L		µg/L		µg/L	
RA-GS-01	RA-GS-01-10-14		9/23/2009	5	U	5	U	5	U	5	U
	RA-GS-01-20-24	20 - 24	9/23/2009	**1.4**	J	5	U	5	U	5	U
	RA-GS-01-30-34	30 - 34	9/23/2009	**2.4**	J	5	U	5	U	5	U
	RA-GS-01-40-44	40 - 44	9/23/2009	**57**		**3**	J	4.8	J	5	U
	RA-GS-01-50-54	50 - 54	9/23/2009	5	U	5	U	5	U	5	U
MW-32I	MW32I-B-RA2	34 - 41	8/30/2011	0.4	J	0.5	U	0.5	U	0.5	U
	MW-32I-R2-RA2		11/27/2012	0.5	U	0.5	U	0.5	U	0.5	U
MW-03I	MW-03I-R1	45.7 - 55.7	6/25/2003	0.5	U	0.5	U	0.5	U	0.5	U
	MW-03I-R2		12/11/2003	**6.6**		0.19	J	0.5	U	0.5	U
	MW-03I-R7		4/7/2009	**21**		0.75		0.5	U	0.5	U
	MW03I-B-RA2		8/30/2011	**9.3**		0.18	J	0.5	U	0.5	U
	MW-03I-R2-RA2		12/6/2012	**19**		0.52		0.5	U	0.5	U
	MW-03I-R4-RA2		10/27/2014	**8.4**		0.32	J	0.27	J	0.5	U
MW-04I	MW-04I-R1	43.9 - 53.9	6/24/2003	**34**		**12**		7.9		0.5	U
	MW-04I-R2		12/15/2003	**48**		**11**		6.1		0.5	U
	MW-04I-R7		4/9/2009	**42**		**8**		23		0.5	U
	MW04I-B-RA2		8/31/2011	**25**		**4.5**	J	19	J	0.13	J
	MW-04I-R2-RA2		12/5/2012	**8.9**		0.89		3.2		0.5	U
	MW-04I-R4-RA2		10/29/2014	0.96		0.5	U	0.41	J	0.5	U
MW-05I	MW-05I-R1	44.5 - 54.5	6/25/2003	0.5	U	0.5	U	0.5	U	0.5	U
	MW-05I-R2		12/10/2003	0.5	U	0.5	U	0.5	U	0.5	U
	MW-05I-R7		4/8/2009	0.5	U	0.5	U	0.5	U	0.5	U
	MW-05I-R1-RA2		4/23/2012	0.5	U	0.5	U	0.5	U	0.5	U
MW-06I	MW-06I-R1	69.9 - 79.9	6/17/2003	0.5	U	0.5	U	0.5	U	0.5	U
	MW-06I-R2		12/9/2003	0.19	J	0.5	U	0.5	U	0.5	U
	MW-06I-R7		4/8/2009	0.5	U	0.5	U	0.5	U	0.5	U
	MW-06I-R1-RA2		4/23/2012	**7.7**		0.38	J	0.5	U	0.5	U
	MW-06I-R4-RA2		11/3/2014	**5.7**		0.21	J	0.5	U	0.5	U
RA-GS-05	RA-GS-05-40-44	40 - 44	9/25/2009	**2.9**	J	5	U	5	U	5	U
	RA-GS-05-50-54	50 - 54	9/25/2009	**3.5**	J	5	U	5	U	5	U
	RA-GS-05-60-64	60 - 64	9/25/2009	**13**		**2.5**	J	5	U	5	U
	RA-GS-05-70-74	70 - 74	9/25/2009	**190**		**54**		27		5	U
	RA-GS-05-80-84	80 - 84	9/25/2009	**11**		**3.8**	J	3.1	J	5	U
	RA-GS-05-90-94	90 - 94	9/25/2009	5	U	5	U	5	U	5	U
	RA-GS-05-100-104	100 - 104	9/25/2009	5	U	5	U	5	U	5	U
MW-33I	MW33I-B-RA2	63 - 73	9/2/2011	0.37	J	0.5	U	0.5	U	0.5	U
	MW33I-R1-RA2		4/23/2012	0.79		0.15	J	0.5	U	0.5	U
	MW-33I-R2-RA2		11/29/2012	0.5	U	0.5	U	0.5	U	0.5	U
	MW-33I-R4-RA2		10/27/2014	0.16	J	0.5	U	0.5	U	0.5	U

Notes:

bgs - below ground surface
µg/L - microgram per liter
cis-1,2-DCE - cis-1,2-dichloroethene
PCE - tetrachloroethene
U - non-detect
TCE - trichloroethene
J - estimated results
VOC - volatile organic compound

Highlighted and bolded results exceeded the 1 µg/L New Jersey Groundwater Quality Standard for PCE and TCE.

Table 3-2b
Groundwater Geochemistry Results between the Facility Area and the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Location	Sample Code	Sample Interval (feet bgs)	Sample Date	Alkalinity		TOC		Nitrate/ Nitrite		Fe 2+		Sulfate		Methane		Ethane		Ethene		pH	Specific Conductivity	DO	ORP
				mg/L		mg/L		mg/L		mg/L		mg/L		µg/L		µg/L		µg/L		std units	mS/cm	mg/L	mV
MW-32I	MW32I-B-RA2	34 - 41	8/30/2011	6.7		1	U	2.9		0.03	U	3.7		3.5		2	U	2	U	5.22	0.071	1.5	116.1
	MW-32I-R2-RA2		11/27/2012	3.4		1	U	4.2		0.24		2.3		2	U	2	U	2	U	4.67	0.068	1.28	265.1
MW-03I	MW-03I-B-RA2	45.7 - 55.7	8/30/2011	9.2		1.9		2.6		0.03	U	22		2	U	2	U	2	U	5.27	0.126	0.52	108.1
	MW-03I-R2-RA2		12/6/2012	13		2.6		2.6		0.10		26		2	U	2	U	2	U	5.25	0.152	0.43	214.5
	MW-03I-R4-RA2		10/27/2014	7.3		1.3		2.5		NA		16		5.93		2	U	2	U	5.16	0.127	0.45	-18.1
MW-04I	MW04I-B-RA2	43.9 - 53.9	8/31/2011	6.6		2.2		4		0.03	U	1.3		2		2	U	2	U	4.96	0.111	1.21	122.7
	MW-04I-R2-RA2		12/5/2012	10		2.7		4.2		0.33		2.8		6.05		2	U	2	U	5.36	0.109	0.48	184.6
	MW-04I-R4-RA2		10/29/2014	14		2.4		2.8		NA		2.7		14.6		2	U	2	U	5.36	0.108	0.07	35.1
MW-05I	MW05I-R1-RA2	44.5 - 54.5	4/23/2012	6.4		1	U	0.22		0.04		1	U	2	U	2	U	2	U	5.18	0.041	6.58	229.7
MW-06I	MW06I-R1-RA2	69.9 - 79.9	4/23/2012	3.9		1.3		2.2		0.03	U	3.4		2	U	2	U	2	U	4.83	0.092	0.35	250.1
	MW06I-R4-RA2		11/3/2014	6		1.4		1.8		NA		5.3		2	U	2	U	2	U	4.95	0.106	0.45	270.1
MW-33I	MW33I-B-RA2	63 - 73	9/2/2011	1.5		1	U	3.9		0.03	U	1.5		2	U	2	U	2	U	4.72	0.201	7.51	303.3
	MW33I-R1-RA2		4/23/2012	1		1	U	4.7		0.03	U	1.6		8.5		2	U	2	U	4.72	0.184	1.97	197.1
	MW-33I-R2-RA2		11/29/2012	1.2		1	U	6.2		0.19		2		49.3		2	U	2	U	4.56	0.432	0.91	265.1
	MW-33I-R4-RA2		10/27/2014	1	U	1.1		5.1		NA		1.9		2	U	2	U	2	U	4.64	0.231	1.46	184.2

Notes:

bgs - below ground surface
DO - dissolved oxygen
µg/L - microgram per liter
mV - millivolt
TOC - total organic carbon
ORP - oxidation-reduction potential
std - standard
U - non-detect
Fe 2+ - ferrous iron
mg/L - milligram per liter
mS/cm - milliSiemen per centimeter
NA - Not Analyzed

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Injection Well								
Station	**Unit**	**INJ-01-R7**	**INJ-01-B-RA2**	**INJ-01-R1-RA2**	**INJ-01-R2-RA2**	**INJ-01-R3-RA2**	**INJ-02-R7**	**INJ-02-R1-RA2**	**INJ-02-R2-RA2**	**INJ-02-R3-RA2**
Sampling Date		4/14/2009	8/31/2011	4/19/2012	12/3/2012	6/4/2013	4/13/2009	4/19/2012	12/3/2012	6/4/2013
Volatile Organic Compounds										
Vinyl Chloride	µg/L	0.67	0.74 J	5 UJ	0.88	0.71	0.88	5 U	1	0.5 U
cis -1,2-Dichloroethene	µg/L	53	40	27	22	17	54	25	31	16
Trichloroethene	µg/L	**1.1**	0.5 U	5 U	0.5 U	0.5 U	**7.8**	5 U	0.5 U	0.5 U
Tetrachloroethene	µg/L	**1.9**	0.5 U	**1.8 J**	0.5 U	0.5 U	**20**	5 U	0.5 U	0.5 U
Wet Chemistry										
Total Organic Carbon	mg/L	18	4.4	47	7.4	5.3	18	7.4	3.5	4.1
Alkalinity	mg/L	85	66	160	170	81	67	71	76	54
pH	SU	6.28	6.12	6.07	6.06	5.9	5.88	5.81	6.00	5.98
Dissolved Oxygen	mg/L	0.59	2.99	0.5	1.6	0.41	1.21	0.21	0.58	1.02
Nitrate/nitrite	mg/L	0.5 UJ	0.05 U	0.05 U	0.066	0.05 U	0.5 UJ	0.05 U	0.079	0.056
Ferrous Iron	mg/L	64	33.8	118.5	82	48.2	23.84	52.5	41	38
Sulfate	mg/L	25 U	1 U	1 U	1 U	1 U	50 U	1 U	1 U	1 U
Methane	µg/L	30,000	39,000	26,000	22,600	26,700	30,000	23,000	23,300	25,700
Oxidation-Reduction Potential	mV	-49.9	-13	-58.6	-51.2	-24.1	-39.1	-280.6	-12.9	-16.1
Ethane	µg/L	1,000 U	2 U	2 U	2 U	2 U	1,000 U	2 U	2 U	2 U
Ethene	µg/L	1,000 U	2 U	2 U	2 U	2 U	1,000 U	2 U	2 U	2 U

Notes:

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

J - estimated value

J+ - estimated high (results are likely reported higher than the true value)

UJ - non-detect with an approximate quantitation limit

U - nondetect (detection limit is indicated)

L - estimated value, bias low

K - estimated value, bias high

NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Injection Well										
Station	**Unit**	**INJ-04-R7**	**INJ-04-R1-RA2**	**INJ-04-R2-RA2**	**INJ-04-R3-RA2**	**INJ-04-R4-RA2**	**INJ-05-R7**	**INJ05-B-RA2**	**INJ-05-R1-RA2**	**INJ-05-R2-RA2**	**INJ-05-R3-RA2**	**INJ-05-R4-RA2**
Sampling Date		4/13/2009	4/19/2012	12/3/2012	6/4/2013	10/29/2014	4/15/2009	8/31/2011	4/19/2012	12/3/2012	6/4/2013	10/29/2014
Volatile Organic Compounds												
Vinyl Chloride	µg/L	0.5 U	5 U	0.5 U	0.5 U	0.5 U	**1.5**	0.38	5 U	0.5 U	0.5 U	0.5 U
cis -1,2-Dichloroethene	µg/L	37	62	**71**	**71**	35 J+	**88**	34	39	53	51	20 J+
Trichloroethene	µg/L	**3.4**	5 U	0.5 U	0.5 U	0.68	0.5 U	0.5 UJ	5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	µg/L	**11**	5 U	0.5 U	**1.5**	**2.1**	0.79	0.5 UJ	5 U	0.5 U	0.5 U	0.5 U
Wet Chemistry												
Total Organic Carbon	mg/L	7.3	3.1	1.7	1.7	1.6	11	2.3	2.3	2.1	1.7	1.2
Alkalinity	mg/L	42	68	72	55	41	85	45	99	110	66	49
pH	SU	5.93	5.98	6.08	5.75	5.76	6.33	6.2	6.2	6.12	5.94	5.9
Dissolved Oxygen	mg/L	0.54	0.68	0.20	0.88	0.43	0	0.94	0.33	0.26	0.2	0.17
Nitrate/nitrite	mg/L	0.13	0.05 U	0.066	0.061	0.05 U	0.25 UJ	0.05 U	0.05 U	0.05 U	0.054	0.05 U
Ferrous Iron	mg/L	15.9	16	30	15.6	15.3	62.2	32.6	37.5	55	13.6	17.5
Sulfate	mg/L	5 U	1 U	1 U	1 U	1 U	25 U	1 U	1 U	1 U	1 U	1 U
Methane	µg/L	16,000	18,000	23,300	21,500	20,700	35,000	29,000	24,000	22,900	27,400	17,200
Oxidation-Reduction Potential	mV	-35.8	-206.5	-59.1	21.7	35.1	-78.3	-64.9	-72.2	-43.5	-29.1	-36.6
Ethane	µg/L	1,000 U	2 U	2 U	2 U	2 U	500 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	1,000 U	2 U	2 U	2 U	2 U	500 U	2 U	2 U	2 U	2 U	2 U

Notes:
µg/L - microgram per liter
mg/L - milligram per liter
SU - Standard Unit
mV - millivolt
J - estimated value
J+ - estimated high (results are likely reported higher than the true value)
UJ - non-detect with an approximate quantitation limit
U - nondetect (detection limit is indicated)
L - estimated value, bias low
K - estimated value, bias high
NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Monitoring Wells 7.5 feet from injection well									
Station	**Unit**	**MW-21D-R7**	**MW-21D-R1-RA2**	**MW-21D-R2-RA2**	**MW-21D-R3-RA2**	**MW-21D-R4-RA2**	**MW-21I-R7**	**MW-21I-R1-RA2**	**MW-21I-R2-RA2**	**MW-21I-R3-RA2**	**MW-21I-R4-RA2**
Sampling Date		4/14/2009	4/19/2012	12/3/2012	6/4/2013	10/29/2014	4/10/2009	4/23/2012	12/4/2012	6/5/2013	10/28/2014
Volatile Organic Compounds											
Vinyl Chloride	µg/L	0.5 U	2.5 UJ	0.5 U	0.5 U	0.3 J	0.5 U	**25 U**	**3.8**	**2.1**	**3**
cis -1,2-Dichloroethene	µg/L	48	23	18	21 J	16 J+	16	25 UJ	47 J	70	**82**
Trichloroethene	µg/L	**2.8**	**1.4 J**	**2.3**	**1.3 J**	**1.7**	**31**	25 UJ	0.5 U	0.5 U	0.5 U
Tetrachloroethene	µg/L	**11**	**5.2**	**8**	**4.6 J**	**5.8**	**190**	**87 J**	0.84	0.5 U	0.33 J
Wet Chemistry											
Total Organic Carbon	mg/L	31	16	11	5.1	4.8	1 U	540	88	18	10
Alkalinity	mg/L	53	120	120	53	99	4	600	540	190	140
pH	SU	6.32	6.01	6.07	5.71	5.87	4.95	5.95	6.03	5.61	5.84
Dissolved Oxygen	mg/L	0.65	0.3	0.37	1.62	0.18	0.54	0.35	0.22	0.53	0.77
Nitrate/nitrite	mg/L	0.11	0.089	0.36	0.18	0.55	2.9	0.05 U	0.05 UL	0.11 L	0.05 U
Ferrous Iron	mg/L	29.1	31.5	94.5	32	47.7	0.08	304.5	247	203	32.9
Sulfate	mg/L	100 UJ	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U
Methane	µg/L	34,000	27,000	16,500	5,570	33,800	25	24,000	21,700	25,200	46,000
Oxidation-Reduction Potential	mV	-85	-22.7	-55.6	94.4	-15.1	226.7	-130.8	-86.9	-14.2	1.3
Ethane	µg/L	500 U	2 U	2 U	2 U	2 U	10 U	2 UL	2 U	2 U	2 U
Ethene	µg/L	500 U	2 U	2 U	2 U	2 U	10 U	2 UL	2 U	2 U	2 U

Notes:

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

J - estimated value

J+ - estimated high (results are likely reported higher than the true value)

UJ - non-detect with an approximate quantitation limit

U - nondetect (detection limit is indicated)

L - estimated value, bias low

K - estimated value, bias high

NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Monitoring Wells 7.5 feet from injection well INJ-01					Monitoring Wells 15 feet from injection well INJ-01				
Station	**Unit**	**MW-21S-R7**	**MW-21S-R1-RA2**	**MW-21S-R2-RA2**	**MW-21S-R3-RA2**	**MW-21S-R4-RA2**	**MW-22D-R7**	**MW-22D-R1-RA2**	**MW-22D-R2-RA2**	**MW-22D-R3-RA2**	**MW-22D-R4-RA2**
Sampling Date		4/10/2009	4/23/2012	12/4/2012	6/5/2013	10/28/2014	4/13/2009	4/19/2012	12/4/2012	6/5/2013	10/28/2014
Volatile Organic Compounds											
Vinyl Chloride	µg/L	0.5 U	0.5 U	0.9 K	0.76	0.79	0.5 U	2.5 U	0.5 U	0.5 UJ	0.5 U
cis -1,2-Dichloroethene	µg/L	14	3.9 J	35 K	45	24 J+	6.1	14	8.6	10 J	7.2
Trichloroethene	µg/L	**20**	0.5 U	0.5 U	0.5 U	0.5 U	**7.7**	0.94 J	0.85	**1.5 J**	**1.3**
Tetrachloroethene	µg/L	**65**	0.5 U	0.5 U	0.5 U	0.5 U	**35**	**5.1**	**7.8**	**4.1 J**	**5.5**
Wet Chemistry											
Total Organic Carbon	mg/L	1 U	29	16	5.7	2.3	1 U	65	66	9.8	2.4
Alkalinity	mg/L	2.3	110	75	58	39	11	100	80	79	33
pH	SU	4.78	5.82	NA	4.91	5.62	5.44	5.97	5.77	6.01	5.71
Dissolved Oxygen	mg/L	0.68	0.16	NA	0.55	0.86	0.68	0.17	0.22	0.13	1.21
Nitrate/nitrite	mg/L	2.9	0.055	0.072	0.053	0.05 U	2.4	0.46	0.99	1.8	3.7
Ferrous Iron	mg/L	0.09	66	45.9	22.2	14.7	3.6	72	27.6	27.4	10.5
Sulfate	mg/L	5 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U
Methane	µg/L	1.4 J	29,000	18,000	36,000	28,100	1,500	18,000	26,000	19,300	22,800
Oxidation-Reduction Potential	mV	277.7	-43.5	NA	101.6	-36.4	103.3	-281.1	-75.8	-26.6	37.5
Ethane	µg/L	10 U	2 U	2 U	2 U	2 U	20 U	2 U	2 U	2 U	2 U
Ethene	µg/L	10 U	2 U	2 U	2 U	2 U	20 U	2 U	2 U	2 U	2 U

Notes:

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

J - estimated value

J+ - estimated high (results are likely reported higher than the true value)

UJ - non-detect with an approximate quantitation limit

U - nondetect (detection limit is indicated)

L - estimated value, bias low

K - estimated value, bias high

NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Monitoring Wells 15 feet from injection well INJ-01								
Station	**Unit**	**MW-22I-R7**	**MW-22I-R1-RA2**	**MW-22I-R2-RA2**	**MW-22I-R3-RA2**	**MW-22I-R4-RA2**	**MW-22S-R7**	**MW-22S-R2-RA2**	**MW-22S-R3-RA2**	**MW-22S-R4-RA2**
Sampling Date		4/14/2009	4/19/2012	12/4/2012	6/5/2013	10/28/2014	4/14/2009	12/4/2012	6/4/2013	10/29/2014
Volatile Organic Compounds										
Vinyl Chloride	µg/L	0.5 UJ	10 U	**1.6 K**	0.75	0.8	0.5 UJ	0.5 U	0.5 U	0.5 U
cis -1,2-Dichloroethene	µg/L	36	**87**	**91**	**82**	**83**	8.9	0.5 U	0.5 U	0.43 J
Trichloroethene	µg/L	**38**	**5.9 J**	**4.5**	**7.6**	**2.1**	**12**	0.5 U	0.5 U	0.5 U
Tetrachloroethene	µg/L	**160**	**37**	**40**	**56**	**15**	**35**	0.64	0.53	0.5 U
Wet Chemistry										
Total Organic Carbon	mg/L	1 U	83	5.9	3.5	3.9	1 U	28	16	9
Alkalinity	mg/L	50	260	140	91	93	7	69	43	61
pH	SU	6.46	6.22	6.02	6.08	6.00	5.3	6.28	5.84	5.79
Dissolved Oxygen	mg/L	0.02	0.73	0.03	0.21	0.11	0.35	0.05	0.27	0.14
Nitrate/nitrite	mg/L	0.18	0.08	0.3	0.36	0.18	2.3	0.28	0.32	0.05 U
Ferrous Iron	mg/L	19.8	267	88	49.6	41	0.55	37.8	38.6	32.85
Sulfate	mg/L	5 U	1 U	1 U	1U	1U	5 U	1 U	1 U	1 U
Methane	µg/L	570	23,000	21,700	16,100	29,800	4.8 J	17,200	28,500	34,000
Oxidation-Reduction Potential	mV	-283	-82.5	-10.2	-35.4	-44.8	156.9	-87.4	-31.6	-64.2
Ethane	µg/L	10 U	2 U	2 U	2 U	2 U	10 U	2 U	2 U	2 U
Ethene	µg/L	10 U	2 U	2 U	2 U	2 U	10 U	2 U	2 U	2 U

Notes:
µg/L - microgram per liter
mg/L - milligram per liter
SU - Standard Unit
mV - millivolt
J - estimated value
J+ - estimated high (results are likely reported higher than the true value)
UJ - non-detect with an approximate quantitation limit
U - nondetect (detection limit is indicated)
L - estimated value, bias low
K - estimated value, bias high
NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Monitoring Wells 25 feet from injection well INJ-01							
Station	**Unit**	**MW-07D-R2-RA2**	**MW-7I-R7**	**MW07I-B-RA2**	**MW-07I-R1-RA2**	**MW-07I-R2-RA2**	**MW-07I-R3-RA2**	**MW-07I-R4-RA2**	**MW-07S-R2-RA2**
Sampling Date		12/3/2012	4/9/2009	8/31/2011	4/20/2012	12/3/2012	6/4/2013	10/28/2014	12/3/2012
Volatile Organic Compounds									
Vinyl Chloride	µg/L	0.5 U	0.5 U	0.37 J	2.5 U	0.5 U	0.5 U	0.23 J	0.5 U
cis -1,2-Dichloroethene	µg/L	0.5 U	**70**	**73**	68	**110**	53	54 J+	0.5 U
Trichloroethene	µg/L	0.5 U	**34**	**7.3**	**6.9 J**	**7.4**	**18**	**4.9**	0.5 U
Tetrachloroethene	µg/L	0.5 U	**130**	**37**	**41 J**	**41**	**160**	**39**	0.53
Wet Chemistry									
Total Organic Carbon	mg/L	1 U	3.4	3.1	73	4.2	2	2.1	25
Alkalinity	mg/L	1 U	37	59	130	110	58	72	77
pH	SU	4.34	5.85	5.99	6.17	5.81	5.76	6.24	5.79
Dissolved Oxygen	mg/L	3.05	1.67	0.27	0.3	0.2	0.49	0.54	0.88
Nitrate/nitrite	mg/L	9.4	0.4	0.34	0.067	0.058	0.56	0.11	0.05
Ferrous Iron	mg/L	0.27	17.52	22.4	87.5	61.5	26.2	31.2	36.5
Sulfate	mg/L	1.9	5 U	1	1 U	1 U	1 U	1 U	1 U
Methane	µg/L	8.68	440	36,000 K	19,000	22,900	4,030	38,000	20,000
Oxidation-Reduction Potential	mV	251	-21	10.8	-201.5	-42.5	22.6	-51.5	-24.6
Ethane	µg/L	2 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	2 U	10 U	2 U	2 U	2 U	2 U	2 U	2 U

Notes:

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

J - estimated value

J+ - estimated high (results are likely reported higher than the true value)

UJ - non-detect with an approximate quantitation limit

U - nondetect (detection limit is indicated)

L - estimated value, bias low

K - estimated value, bias high

NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Monitoring Wells 7.5 feet from injection well INJ-02									
Station	**Unit**	**MW-23D-R7**	**MW-23D-R1-RA2**	**MW-23D-R2-RA2**	**MW-23D-R3-RA2**	**MW-23D-R4-RA2**	**MW-23I-R7**	**MW-23I-R1-RA2**	**MW-23I-R2-RA2**	**MW-23I-R3-RA2**	**MW-23I-R4-RA2**
Sampling Date		4/13/2009	4/19/2012	12/4/2012	6/3/2013	10/28/2014	4/13/2009	4/23/2012	12/4/2012	6/3/2013	10/28/2014
Volatile Organic Compounds											
Vinyl Chloride	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.37 J	0.5 U	5 UJ	**2.9**	0.56	0.47 J
cis -1,2-Dichloroethene	µg/L	40	13	15	11	9.4	18	11 J	22	14	12
Trichloroethene	µg/L	**9.7**	0.68	**1.3**	**1.9 K**	**1.8**	**33**	5 UJ	0.5 U	0.5 U	0.5 U
Tetrachloroethene	µg/L	**30**	**2**	**5**	**7 K**	**6.8**	**170**	**11 J**	**1.8**	0.5 U	0.5 U
Wet Chemistry											
Total Organic Carbon	mg/L	29	3.2	1.8	1.6	1.2	1.4	140	39	12	10
Alkalinity	mg/L	64	57	44	29	29	15	350	320	120	110
pH	SU	6.18	6.07	5.79	5.71	5.35	5.46	5.92	5.64	5.75	6.01
Dissolved Oxygen	mg/L	1.01	0.21	0.44	3.07	7.68	0.66	0.28	1.68	2.52	0.34
Nitrate/nitrite	mg/L	0.05 U	0.081	0.17	0.34	0.55	1.5	0.05 U	0.05 U	0.05 U	0.05 U
Ferrous Iron	mg/L	33.96	7	10	0.6	4.4	1.86	244.5	195	85	32.7
Sulfate	mg/L	25 UJ	1 U	1 U	1 U	1 U	5 U	1.6	1 U	1 U	1 U
Methane	µg/L	31,000	18,000	14,900	19,000	12,500	100	24,000	16,200	31,300	34,500
Oxidation-Reduction Potential	mV	-78.4	-50.8	-4.7	-38.9	85.9	90.3	-289.7	-29.5	14.9	-38.5
Ethane	µg/L	1,000 U	2 U	2 U	2 U	2 U	10 U	2 U	2 U	2 U	2 U
Ethene	µg/L	1,000 U	2 U	2 U	2 U	2 U	10 U	2 U	2 U	2 U	2 U

Notes:

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

J - estimated value

J+ - estimated high (results are likely reported higher than the true value)

UJ - non-detect with an approximate quantitation limit

U - nondetect (detection limit is indicated)

L - estimated value, bias low

K - estimated value, bias high

NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Monitoring Wells 7.5 feet from injection well INJ-02					Monitoring Wells 15 feet from injection well INJ-02					
Station	**Unit**	**MW-23S-R7**	**MW-23S-R1-RA2**	**MW-23S-R2-RA2**	**MW-23S-R3-RA2**	**MW-23S-R4-RA2**	**MW-24D-R7**	**MW24D-B-RA2**	**MW-24D-R1-RA2**	**MW-24D-R2-RA2**	**MW-24D-R3-RA2**	**MW-24D-R4-RA2**
Sampling Date		4/13/2009	4/19/2012	12/4/2012	6/3/2013	10/29/2014	4/10/2009	8/31/2011	4/20/2012	12/4/2012	6/3/2013	10/28/2014
Volatile Organic Compounds												
Vinyl Chloride	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.47 J
cis -1,2-Dichloroethene	µg/L	1.6	0.97 U	0.8	0.94	0.77 J+	18	3.4	14	11	20 J	9.8
Trichloroethene	µg/L	**6**	0.3 J	0.5 U	0.5 U	0.5 U	**19**	**4.1**	**2.7**	**2.6**	**2.6 J**	**1.7**
Tetrachloroethene	µg/L	**20**	**16**	**9.9**	**3.6**	0.51	**89**	**25**	**11**	**10**	**12 J**	**6.7**
Wet Chemistry												
Total Organic Carbon	mg/L	17	13	5.8	5.1	4.7	1 U	1 U	23	26	23	28
Alkalinity	mg/L	16	28	27	32	17	7.3	3.7	52	36	37	11
pH	SU	5.48	5.23	5.31	5.53	5.63	5	4.96	5.89	5.22	5.18	5.49
Dissolved Oxygen	mg/L	0.82	0.15	0.47	14.91	0.2	1.2	2.77	0.18	0.31	0.18	5.56
Nitrate/nitrite	mg/L	0.1	0.053	0.05 U	0.05 U	0.05 U	3.7	5.2	1.1	2.5	0.05 U	4.4
Ferrous Iron	mg/L	12.67	7.5	7.5	0.85	6.9	2.11	0.42	31	12	2.4	5.3
Sulfate	mg/L	5 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U	1 U
Methane	µg/L	2,400	22,000	17,800	25,700	23,400	120	1,200	10,000	16,200	16,300	10,000
Oxidation-Reduction Potential	mV	-142.8	87.9	79.7	50.4	29.4	133.6	113.5	-58.8	58.4	33.5	35.5
Ethane	µg/L	50 U	2 U	2 U	2 U	2 U	10 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	50 U	2 U	2 U	2 U	2 U	10 U	2 U	2 U	2 U	2 U	2 U

Notes:
µg/L - microgram per liter
mg/L - milligram per liter
SU - Standard Unit
mV - millivolt
J - estimated value
J+ - estimated high (results are likely reported higher than the true value)
UJ - non-detect with an approximate quantitation limit
U - nondetect (detection limit is indicated)
L - estimated value, bias low
K - estimated value, bias high
NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Monitoring Wells 15 feet from injection well INJ-02									
Station	**Unit**	**MW-24I-R7**	**MW-24I-R1-RA2**	**MW-24I-R2-RA2**	**MW-24I-R3-RA2**	**MW-24I-R4-RA2**	**MW-24S-R7**	**MW-24S-R1-RA2**	**MW-24S-R2-RA2**	**MW-24S-R3-RA2**	**MW-24S-R4-RA2**
Sampling Date		4/10/2009	4/20/2012	12/4/2012	6/4/2013	10/28/2014	4/9/2009	4/20/2012	12/5/2012	6/4/2013	10/28/2014
Volatile Organic Compounds											
Vinyl Chloride	µg/L	0.5 U	5 U	**3**	**2.8**	**1.8**	0.5 U	0.5 U	0.68	0.5 U	0.2 J
cis -1,2-Dichloroethene	µg/L	16	**89**	**180**	**220**	**120**	5.3	5 J	14	3.9	2.1 J+
Trichloroethene	µg/L	**31**	5 U	0.5 U	0.5 U	0.5 U	**11**	0.3 J	0.5 U	0.5 U	0.5 U
Tetrachloroethene	µg/L	**170**	**5.2**	0.5 U	0.5 U	0.5 U	**33**	**1.1**	**1.1**	0.86	0.4 J
Wet Chemistry											
Total Organic Carbon	mg/L	1 U	57	10	7.7	3.7	1 U	50	11	6.4	7.4
Alkalinity	mg/L	10	220	270	160	100	17	120	83	33	15
pH	SU	5.32	6.24	6.19	6.15	5.43	5.49	6.11	5.88	5.22	5.55
Dissolved Oxygen	mg/L	0.19	0.34	0.22	6.67	3.22	1.63	0.16	0.59	0.21	0.24
Nitrate/nitrite	mg/L	3.1	0.058	0.05 U	0.05 U	0.05 U	1.5	1.3	1.2	1.9	2.2
Ferrous Iron	mg/L	0.13	140.5	123.5	64	38.7	0.06	88	36.6	11	4.8
Sulfate	mg/L	5 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	1 U	1 U
Methane	µg/L	9,300	33,000	27,700	30,200	29,900	29	22,000	30,800	28,800	26,300
Oxidation-Reduction Potential	mV	-53.1	-66.2	-108.3	-40.2	48.9	200.6	-80.4	-44.2	73.1	27.2
Ethane	µg/L	500 U	2 U	2 U	2 U	2 U	10 U	2 U	2 U	2 U	2 U
Ethene	µg/L	500 U	2 U	2 U	2 U	2 U	10 U	2 U	2 U	2 U	2 U

Notes:

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

J - estimated value

J+ - estimated high (results are likely reported higher than the true value)

UJ - non-detect with an approximate quantitation limit

U - nondetect (detection limit is indicated)

L - estimated value, bias low

K - estimated value, bias high

NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-3
Groundwater Sample Results at the Treatability Study Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

		Monitoring Well 25 feet away from injection well INJ-02					
Station	**Unit**	**MW-25I-R7**	**MW25I-B-RA2**	**MW-25I-R1-RA2**	**MW-25I-R2-RA2**	**MW-25I-R3-RA2**	**MW-25I-R4-RA2**
Sampling Date		4/9/2009	8/31/2011	4/19/2012	12/5/2012	6/4/2013	10/27/2014
Volatile Organic Compounds							
Vinyl Chloride	µg/L	0.5 U	0.5 U	20 U	0.5 U	0.5	0.35 J
cis -1,2-Dichloroethene	µg/L	19	20	**99**	59	**90**	**94**
Trichloroethene	µg/L	**21**	**18**	**4.4 J**	**18**	**19**	**14**
Tetrachloroethene	µg/L	**190**	**130**	**47**	**120**	**170**	**150**
Wet Chemistry							
Total Organic Carbon	mg/L	1 U	1.1	42	6.4	3.8	1.7
Alkalinity	mg/L	28	17	110	68	64	64
pH	SU	5.66	5.51	6.21	5.99	5.76	5.92
Dissolved Oxygen	mg/L	0.7	0.96	0.18	0.30	0.24	0.37
Nitrate/nitrite	mg/L	1.5	0.68	0.23 L	0.59	0.42	0.32
Ferrous Iron	mg/L	NA	2.28	64	30.9	23.4	31.6
Sulfate	mg/L	5 U	1 U	1 U	1.4	1 U	1 U
Methane	µg/L	660	33,000	15,000	23,100	40,500	45,000
Oxidation-Reduction Potential	mV	122.2	76.6	-61	-7.0	2.1	-5.8
Ethane	µg/L	10 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	10 U	2 U	2 U	2 U	2 U	2 U

Notes:

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

J - estimated value

J+ - estimated high (results are likely reported higher than the true value)

UJ - non-detect with an approximate quantitation limit

U - nondetect (detection limit is indicated)

L - estimated value, bias low

K - estimated value, bias high

NA - not analyzed

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for vinyl chloride, trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-4
Groundwater Sample Results at the Biobarrier Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Chemical Name		Upgradient of the Biobarrier									
	Event	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4
	Sample Code	MW36-B-RA2	MW-36-R1-RA2	MW-36-R2-RA2	MW-36-R3-RA2	MW-36-R4-RA2	MW39-B-RA2	MW-39-R1-RA2	MW-39-R2-RA2	MW-39-R3-RA2	MW-39-R4-RA2
	Depth	92 to 102 ft	92 to 102 ft	92 to 102 ft	92 to 102 ft	92 to 102 ft	79 to 84 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft
Volatile Organic Compounds											
Vinyl Chloride	µg/L	0.5 U	10 U	0.5 U	0.5 U	0.5 U	8 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	µg/L	3.9	19	17	15	14 J+	5.3 J	6.3	7.7	7	11
Trichloroethene	µg/L	**3.5**	**18**	**24**	**19**	**16**	8 U	**11**	**13**	**11**	**15**
Tetrachloroethene	µg/L	**34**	**140**	**150**	**120**	**92**	**88**	**59**	**100**	**93**	**89**
Wet Chemistry											
Total Organic Carbon	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.8	1.1
Alkalinity, Total	mg/L	1.2	1.9	2.3	1.8	1.8	5.9	2.4	5.2	2.7	4.6
pH	SU	4.86	5.36	4.78	4.71	4.69	4.97	4.87	4.9	4.69	5.03
DO	mg/L	0.99	0.31	0.32	1.93	0.24	2.04	0.64	0.81	0.37	0.41
Nitrate/nitrite	mg/L	1.2	3.8	3.5	2.4	2.2	3.7	3.5	3.4	2.4	2.8
Ferrous Iron	mg/L	0.24	0.07	0.09	0.12	0.03 U	0.03 U	0.03	0.16	0.03 U	0.03 U
Sulfate	mg/L	12	1 U	1	2.6	1.6	1 U	2.1	1.6	1.5	1.2
Methane	µg/L	51	510	425	982	4870	35	27	28.7	44.3	377
ORP	mV	238.2	-246.7	192.3	125.6	232.6	253	-246.8	196.2	239.4	194.6
Ethane	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U

Notes:

ft - feet

DO = dissolved oxygen

ORP = oxidation-reduction potential

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

U - non-detect

R - rejected value

J - estimated value

UJ - non-detect with an approximate quantitation limit

L - results bias low

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-4
Groundwater Sample Results at the Biobarrier Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Chemical Name		Within Biobarrier																	
	Event	BASELINE	BASELINE	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4
	Sample Code	INJ12-B-RA2	INJ37-B-RA2	INJ14-B-RA2	INJ-14-R1-RA2	INJ-14-R2-RA2	INJ-14-R3-RA2	INJ-14-R4-RA2	INJ15-B-RA2	INJ-15-R1-RA2	INJ-15-R2-RA2	INJ-15-R3-RA2	INJ-15-R4-RA2
	Depth	70 to 85 ft	90 to 105 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft	76 to 86 ft
Volatile Organic Compounds																			
Vinyl Chloride	µg/L	5 U	2.5 U	5 U	2.5 R	0.5 U	0.5 U	1	2.5 U	2.5 U	0.5 U	0.5 U	0.62 J+
cis-1,2-Dichloroethene	µg/L	3.7 J	2.2 J	3.6 J	4.7 UJ	14	32	**85** J+	3.2	4.4 U	9	5.3	16 J+
Trichloroethene	µg/L	**3.4** J	**1.4** J	**4.2** J	**9.7** J	**5.3**	**2.7**	0.83	**3.9**	**7.7** J	**19**	**7.2**	**22**
Tetrachloroethene	µg/L	**100**	**48**	**71**	**9** J	**18**	**8.7**	**2**	**53**	**7.2** J	**83**	**42**	**93**
Wet Chemistry																			
Total Organic Carbon	mg/L	1 U	1 U	1 U	100	74	170	110	1 U	100	75	260	60
Alkalinity, Total	mg/L	2.9	1.1	4.7	54	90	160	140	17	81	74	58	110
pH	SU	4.85	4.67	5.01	5.71	5.99	5.85	5.96	5.77	6.18	6.28	5.25	6.03
DO	mg/L	2.55	2.34	5.97	0.16	0.38	0.56	0.2	6.46	0.26	0.13	0.39	0.05
Nitrate/nitrite	mg/L	3.4	5.4	3.4	0.05 U	0.05 U	0.17 L	0.05 U	3.3	0.05 U	0.072	0.36	0.05 U
Ferrous Iron	mg/L	0.07	0.03 U	0.04	18	82	100.8	54.6	1.01	20	70	2.85	45.4
Sulfate	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2	1 U	1 U	1 U	1 U
Methane	µg/L	19	9.6	24	12	1280	16,700	28,100	35	44	3,480	16,800	27,700
ORP	mV	131.2	170.8	160.9	-55.1	-55.2	-27.2	-105.9	109.6	-97.7	-24.9	-42.1	-106.1
Ethane	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2.4	2 U	9.28	9.28
Ethene	µg/L	2 U	2 U	2 U	5.7	2 U	2 U	2 U	2 U	7.6	2 U	2.88	2.88

Notes:
ft - feet
DO = dissolved oxygen
ORP = oxidation-reduction potential
µg/L - microgram per liter
mg/L - milligram per liter
SU - Standard Unit
mV - millivolt
U - non-detect
R - rejected value
J - estimated value
UJ - non-detect with an approximate quantitation limit
L - results bias low
Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-4
Groundwater Sample Results at the Biobarrier Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Chemical Name		Within Biobarrier												
	Event	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4	BASELINE	BASELINE	BASELINE	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4
	Sample Code	MW40-B-RA2	MW-40-R1-RA2	MW-40-R2-RA2	MW-40-R3-RA2	MW-40-R4-RA2	INJ22-B-RA2	INJ27-B-RA2	INJ30-B-RA2	MW44-B-RA2	MW-44-R1-RA2	MW-44-R2-RA2	MW-44-R3-RA2	MW-44-R4-RA2
	Depth	75 to 85 ft	75 to 85 ft	75 to 85 ft	75 to 85 ft	75 to 85 ft	75 to 85 ft	80 to 90 ft	80 to 90 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft
Volatile Organic Compounds														
Vinyl Chloride	µg/L	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	2.5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	µg/L	3.1	3.4	5.8	7.1	7.3 J+	2.3	3	5.9	2.7	0.5 U	0.5 U	0.5 U	0.87 J+
Trichloroethene	µg/L	**5**	**7.4**	**13**	**13**	**12**	**2.3**	**3.6**	**8.5**	**4.3**	0.33 J	0.5 U	0.5 U	**1.5**
Tetrachloroethene	µg/L	**36**	**38**	**77**	**94**	**71**	**16**	**44**	**99**	**56**	**6.4**	**4.5**	**4.7**	**20**
Wet Chemistry														
Total Organic Carbon	mg/L	1 U	1 U	1 U	1.4	1.2	1 U	1 U	1 U	1 U	1 U	1 U	1.3	1 U
Alkalinity, Total	mg/L	18	2.4	3.4	4.6	5.5	1.2	9.5	2.7	1 U	8.6	2.5	1 U	1 U
pH	SU	5.44	4.83	4.78	4.77	4.89	4.7	5.4	4.78	4.51	5.3	4.8	4.53	4.59
DO	mg/L	10.48	0.51	0.41	0.4	0.59	1.42	0.53	1.48	9.79	0.85	1.7	5.5	3.33
Nitrate/nitrite	mg/L	3.1	2.3	2.6	1.7	2.3	4.5	3.7	4.9	7.3	3.2	4.9	4.4	4.1
Ferrous Iron	mg/L	0.07	0.08	0.08	0.16	0.03 U	0.03 U	0.08	0.16	0.03 U	0.29	0.68	<0.03	0.98
Sulfate	mg/L	2.7	1.3	1.7	2.5	2.2	1.1	1.1	1.2	2.3	3	2.5	4.2	1.6
Methane	µg/L	6	2 U	7.75	21.8	515	2 U	2 U	33	2 U	35	47.3	10.2	2 U
ORP	mV	169.6	210	252.5	206.4	263.7	342.2	199.1	126.7	155	152.7	272.9	240.2	290.5
Ethane	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U

Notes:
ft - feet
DO = dissolved oxygen
ORP = oxidation-reduction potential
µg/L - microgram per liter
mg/L - milligram per liter
SU - Standard Unit
mV - millivolt
U - non-detect
R - rejected value
J - estimated value
UJ - non-detect with an approximate quantitation limit
L - results bias low
Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-4
Groundwater Sample Results at the Biobarrier Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Chemical Name			Downgradient of the Northern Portion of Biobarrier										
	Event	BASELINE	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4
	Sample Code	INJ36-B-RA2	MW41-B-RA2	MW-41-R1-RA2	MW-41-R2-RA2	MW-41-R3-RA2	MW-41-R4-RA2	MW42-B-RA2	MW-42-R1-RA2	MW-42-R2-RA2	MW-42-R3-RA2	MW-42-R4-RA2
	Depth	78 to 88 ft	75 to 85 ft	75 to 85 ft	75 to 85 ft	75 to 85 ft	75 to 85 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft
Volatile Organic Compounds												
Vinyl Chloride	µg/L	0.5 U	5 U	0.5 U	0.5 U	0.5 U	0.19 J	5 U	0.5 U	0.5 U	0.5 U	0.27 J
cis-1,2-Dichloroethene	µg/L	0.28 J	5.3	7.1	11	24	31 J+	7.4	7	9.3	15	63 J+
Trichloroethene	µg/L	0.33 J	8 U	**5.5**	**16**	**11**	**15**	6.6 U	**5.5** J	**17**	**17**	**9.7**
Tetrachloroethene	µg/L	**4.9**	**99**	**60**	**88**	**77**	**110**	**110**	**53**	**49**	**56**	**47**
Wet Chemistry												
Total Organic Carbon	mg/L	1 U	1 U	4.2	5.4	12	5.6	1 U	11	6.8	26	7.1
Alkalinity, Total	mg/L	1.6	3.9	29	53	51	17	24	13	44	98	56
pH	SU	4.75	5.06	5.29	6.29	5.48	5.21	5.63	5.06	5.73	5.14	6.2
DO	mg/L	3.78	3.93	0.29	0.23	0.55	0.17	7.33	0.32	0.30	0.9	0.43
Nitrate/nitrite	mg/L	7	3.2	1.4	1.3	0.77	1.7	3.6	0.31	0.48	0.16	0.2
Ferrous Iron	mg/L	0.09	0.11	6.8	27.8	23	9	0.03 U	7.8	11.4	35	31.6
Sulfate	mg/L	1 U	1.3	1.9	1 U	1.2	2.4	1.5	1 U	2.2	1 U	1 U
Methane	µg/L	12	38	49	76.3	270	1,700	31	33	89.1	1,390	3,860
ORP	mV	132.2	137.7	-249	-66.7	-40.2	146.9	128.3	92.7	-34.4	86.6	-61.1
Ethane	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U

Notes:
ft - feet
DO = dissolved oxygen
ORP = oxidation-reduction potential
µg/L - microgram per liter
mg/L - milligram per liter
SU - Standard Unit
mV - millivolt
U - non-detect
R - rejected value
J - estimated value
UJ - non-detect with an approximate quantitation limit
L - results bias low
Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-4
Groundwater Sample Results at the Biobarrier Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Chemical Name		Downgradient of the Northern Portion of Biobarrier									
	Event	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4
	Sample Code	MW43-B-RA2	MW-43-R1-RA2	MW-43-R2-RA2	MW-43-R3-RA2	MW-43-R4-RA2	MW47-B-RA2	MW-47-R1-RA2	MW-47-R2-RA2	MW-47-R3-RA2	MW-47-R4-RA2
	Depth	77 to 82 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft	77 to 82 ft
Volatile Organic Compounds											
Vinyl Chloride	µg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.14 J
cis-1,2-Dichloroethene	µg/L	4.8	3.7	6.7	5.2	7.6 J+	2.2	1.8	2.2	2	32
Trichloroethene	µg/L	**5.2**	**5.1** J	**13**	**9.9**	**11**	**2.5**	**1.4**	**2.6**	**2.8**	**6**
Tetrachloroethene	µg/L	**130**	**56**	**110**	**67**	**68**	**100**	**43**	**49**	**34**	**82**
Wet Chemistry											
Total Organic Carbon	mg/L	1 U	1 U	1.1	1.8	1.1	1 U	90	7.8	3.7	56
Alkalinity, Total	mg/L	32	5.4	4.5	14	3.3	14	3.5	22	14	100
pH	SU	5.64	5.16	4.79	4.89	4.64	5.28	4.89	5.25	4.77	6.01
DO	mg/L	8.63	0.51	0.46	2.09	0.64	1.38	0.43	0.72	0.21	0.23
Nitrate/nitrite	mg/L	3.6	2.3	3.2	0.73	1.8	3.6	0.69	0.69	0.067	0.26
Ferrous Iron	mg/L	0.03 U	0.5	0.10	<0.03	0.1	0.06	3.12	6.9	2.24	61
Sulfate	mg/L	1.2	1 U	1 U	1 U	1 U	1.3	1 U	1 U	1.7	1 U
Methane	µg/L	24	22	21.8	16	195	16	6.2	24.9	90.3	7,940
ORP	mV	105.1	120.6	226.9	107.7	198.9	198.4	71.2	-45.3	296.1	-26.6
Ethane	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2.15	2 U

Notes:

ft - feet

DO = dissolved oxygen

ORP = oxidation-reduction potential

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

U - non-detect

R - rejected value

J - estimated value

UJ - non-detect with an approximate quantitation limit

L - results bias low

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-4
Groundwater Sample Results at the Biobarrier Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Chemical Name		Downgradient of the Northern Portion of Biobarrier										MW-12I							
	Event	BASELINE		ROUND 1		ROUND 2		ROUND 3		ROUND 4		ROUND 1		ROUND 2		ROUND 3		ROUND 4	
	Sample Code	MW48-B-RA2		MW-48-R1-RA2		MW-48-R2-RA2		MW-48-R3-RA2		MW-48-R4-RA2		MW-12I-R1-RA2		MW-12I-R2-RA2		MW-12I-R3-RA2		MW-12I-R4-RA2	
	Depth	90 to 100 ft		90 to 100 ft		90 to 100 ft		90 to 100 ft		90 to 100 ft		100 to 110 ft		100 to 110 ft		100 to 110 ft		100 to 110 ft	
Volatile Organic Compounds																			
Vinyl Chloride	µg/L	2.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,2-Dichloroethene	µg/L	1.8	J	3.3		1.7		2.8		3.8	J+	0.5	U	0.5	U	0.5	U	0.5	U
Trichloroethene	µg/L	**1.1**	J	**2**	J	**1.5**		**3.1**		**2.8**		0.5	U	0.5	U	0.5	U	0.5	U
Tetrachloroethene	µg/L	**43**		**120**		**68**		**90**		**45**		0.5	U	0.5	U	0.5	U	0.5	U
Wet Chemistry																			
Total Organic Carbon	mg/L	1	U	1	U	1	U	32		1.5		1.3		1	U	5.1		1	U
Alkalinity, Total	mg/L	1.2		2.7		3.7		77		47		1	U	1	U	1.3		1	U
pH	SU	4.82		4.48		5.1		6.05		6.67		4.22		3.44		4.24		4.22	
DO	mg/L	3.29		0.45		0.43		0.41		0.1		4.17		4.02		6.86		2.76	
Nitrate/nitrite	mg/L	6.8		4.7		1.7		0.32		1.1		14		16		9.2		11	
Ferrous Iron	mg/L	0.77		0.02		0.13		37		22.2		0.03	U	0.17		0.03	U	0.03	U
Sulfate	mg/L	1	U	1.2		1.4		1.7		3		2.6		1		2.7		1.9	
Methane	µg/L	2	U	8.4		3.43		9.83		73.5		2	U	2	U	2	U	6.13	
ORP	mV	138.5		-314.2		225.5		-33.4		-127		-207.9		386.0		185.9		276.8	
Ethane	µg/L	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Ethene	µg/L	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U

Notes:

ft - feet

DO = dissolved oxygen

ORP = oxidation-reduction potential

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

U - non-detect

R - rejected value

J - estimated value

UJ - non-detect with an approximate quantitation limit

L - results bias low

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-4
Groundwater Sample Results at the Biobarrier Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Chemical Name		Downgradient of the Southern Portion of Biobarrier									
	Event	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4
	Sample Code	MW45-B-RA2	MW-45-R1-RA2	MW-45-R2-RA2	MW-45-R3-RA2	MW-45-R4-RA2	MW34I-B-RA2	MW-34I-R1-RA2	MW-34I-R2-RA2	MW-34I-R3-RA2	MW-34I-R4-RA2
	Depth	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft
Volatile Organic Compounds											
Vinyl Chloride	µg/L	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	µg/L	5 U	4	3.5	2.2	3.1 J+	3.2	1.9	1.6	0.71	0.93 J+
Trichloroethene	µg/L	5 U	**4.4** J	**4**	**2.3**	**5.6**	**4.6**	**2.3** J	**1.8**	0.66	**1.9**
Tetrachloroethene	µg/L	**65**	**70**	**46**	**51**	**88**	**68**	**39**	**38**	**13**	**24**
Wet Chemistry											
Total Organic Carbon	mg/L	1 U	1 U	1 U	1	1 U	1 U	1 U	1 U	1 U	1.2
Alkalinity, Total	mg/L	4.2	1 U	1.9	1	1.1	1 U	1	1	1 U	1 U
pH	SU	5.14	4.57	5.19	4.13	4.65	4.29	4.52	4.65	4.59	4.34
DO	mg/L	3.01	1.11	1,75	2.49	2.46	6.07	2.68	3.86	5.88	4.23
Nitrate/nitrite	mg/L	6.5	5.7	7	5.6	8.4	6.7	5	5.8	4.7	4.6
Ferrous Iron	mg/L	0.03 U	0.04	0.15	0.03 U	0.03 U	0.03 U	0.06	0.08	0.13	0.03 U
Sulfate	mg/L	1.8	1	1 U	1.8	1 U	1.2	1 U	1 U	1.4	1 U
Methane	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	12.7
ORP	mV	151.5	303.7	279.1	428.8	276.2	178.5	277.1	319.9	200.8	238.7
Ethane	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U

Notes:

ft - feet

DO = dissolved oxygen

ORP = oxidation-reduction potential

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

U - non-detect

R - rejected value

J - estimated value

UJ - non-detect with an approximate quantitation limit

L - results bias low

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-4
Groundwater Sample Results at the Biobarrier Area
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Chemical Name		Downgradient of the Southern Portion of Biobarrier									
	Event	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4	BASELINE	ROUND 1	ROUND 2	ROUND 3	ROUND 4
	Sample Code	MW34D-B-RA2	MW-34D-R1-RA2	MW-34D-R2-RA2	MW-34D-R3-RA2	MW-34D-R4-RA2	MW46-B-RA2	MW-46-R1-RA2	MW-46-R2-RA2	MW-46-R3-RA2	MW-46-R4-RA2
	Depth	98 to 108 ft	98 to 108 ft	98 to 108 ft	98 to 108 ft	98 to 108 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft	78 to 88 ft
Volatile Organic Compounds											
Vinyl Chloride	µg/L	**1.1**	0.65	**1.3**	0.56	0.5 U	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	µg/L	25	21	25	17	3.8 J+	2.7	3.1	2.4	1.6	1.3 J+
Trichloroethene	µg/L	**4.8**	**3.8**	**4.5**	**2.8**	0.71	2.7 U	**2.9** J	**2.4**	**1.4**	**2.1**
Tetrachloroethene	µg/L	**12**	**9.2**	**12**	**7**	**2.1**	**43**	**42**	**45**	**27**	**31**
Wet Chemistry											
Total Organic Carbon	mg/L	1 U	1 U	1 U	1 U	1.4	1 U	12	1 U	1.1	1 U
Alkalinity, Total	mg/L	1 U	1 U	1 U	1 U	1 U	1.3	9.2	2.3	6.1	2.4
pH	SU	4.53	4.6	4.48	4.34	4.61	4.74	4.8	4.98	3.65	4.79
DO	mg/L	3.73	2.08	3.39	2.97	3.06	6.5	0.31	1.4	2.36	2.44
Nitrate/nitrite	mg/L	5.4	4.1	4.4	3.6	3.7	7.4	0.9	5.6	4	4.7
Ferrous Iron	mg/L	0.03 U	0.08	0.20	0.13	0.03 U	0.31	7.8	0.29	0.35	0.23
Sulfate	mg/L	2	2.3	1.4	3.2	1 U	1 U	1.3	1 U	1.6	1 U
Methane	µg/L	2 U	2 U	2 U	6.3	2 U	2 U	2 U	2 U	2 U	4.53
ORP	mV	195.6	187.1	308.9	358.8	243.1	119.8	-255.1	258.6	486.2	254.7
Ethane	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U

Notes:

ft - feet

DO = dissolved oxygen

ORP = oxidation-reduction potential

µg/L - microgram per liter

mg/L - milligram per liter

SU - Standard Unit

mV - millivolt

U - non-detect

R - rejected value

J - estimated value

UJ - non-detect with an approximate quantitation limit

L - results bias low

Results highlighted in yellow and bolded exceed the New Jersey Groundwater Quality Standard of 1 µg/L for trichloroethene or tetrachloroethene or 70 µg/L for cis-1,2-dichloroethene.

Tetrachloroethene results highlighted in orange and bolded exceed 50 µg/L.

Table 3-5a
Groundwater VOC Results in Areas Downgradient of the Biobarrier
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Well ID	Sample Code	Sample Interval (feet bgs)	Sample Date	PCE		TCE		cis-1,2-DCE		Vinyl Chloride	
				µg/L		µg/L		µg/L		µg/L	
MW-37	MW-37-B-RA2	76 - 86	9/8/2011	**46**		**1.9**	J	2.3	J	2.5	U
	MW-37-R1-RA2		4/18/2012	**18**		**1.2**		1.2		0.5	U
	MW-37-R2-RA2		11/30/2012	**35**		**2.9**		1.8		0.5	U
	MW-37-R4-RA2		10/30/2014	**18**		**1.8**		1.5		0.5	U
RA-GS-31	RA-GS-31-60-64	60 - 64	10/8/2009	**2.3**	J	5	U	5	U	5	U
	RA-GS-31-66-70	66 - 70	10/8/2009	**3.6**	J	5	U	5	U	5	U
	RA-GS-31-72-76	72 - 76	10/8/2009	**51**		5	U	1.5	J	5	U
	RA-GS-31-78-82	78 - 82	10/8/2009	**29**		5	U	5	U	5	U
	RA-GS-31-84-88	84 - 88	10/8/2009	**35**		5	U	5	U	5	U
	RA-GS-31-90-94	90 - 94	10/8/2009	**26**		5	U	5	U	5	U
	RA-GS-31-100-104	100 - 104	10/8/2009	**30**		5	U	2	J	5	U
RA-GS-43	RA-GS-43-70-75	70 - 75	5/25/2010	5	U	5	U	5	U	5	U
	RA-GS-43-80-85	80 - 85	5/25/2010	**31**		5	U	5	U	5	U
	RA-GS-43-90-95	90 - 95	5/25/2010	**7.1**		5	U	5	U	5	U
	RA-GS-43-100-105	100 - 105	5/25/2010	**29**		5	U	5	U	5	U
	RA-GS-43-110-115	110 - 115	5/25/2010	**63**		5	U	5.1		5	U
	RA-GS-43-120-125	120 - 125	5/26/2010	5	U	5	U	5	U	5	U
	RA-GS-43-130-135	130 - 135	5/26/2010	5	U	5	U	5	U	5	U
	RA-GS-43-140-145	140 - 145	5/26/2010	5	U	5	U	5	U	5	U
	RA-GS-43-150-155	150 - 155	5/26/2010	5	U	5	U	5	U	5	U
	RA-GS-43-160-165	160 - 165	5/26/2010	5	U	5	U	5	U	5	U
MW-38I	MW-38I-B-RA2	72 - 82	9/8/2011	**1.3**		0.16	J	0.11	J	0.5	UJ
	MW-38I-R1-RA2		4/18/2012	0.25	J	0.5	U	0.5	U	0.5	U
	MW-38I-R2-RA2		11/30/2012	**1.6**		0.5	U	0.5	U	0.5	U
	MW-38I-R4-RA2		10/31/2014	0.24	J	0.5	U	0.5	U	0.5	U
MW-38D	MW-38D-B-RA2	106 - 116	9/8/2011	**17**		**1.1**		2		0.5	U
	MW-38D-R1-RA2		4/18/2012	**13**		0.65		1.4		0.5	U
	MW-38D-R2-RA2		11/30/2012	**11**		0.61		0.79		0.5	U
	MW-38D-R4-RA2		10/31/2014	**21**		**1.2**		1.3		0.5	U
MW-11I	MW-11I-B-RA2	99.1 - 109.1	9/2/2011	**1.2**		0.48	J	1.4		0.5	U
	MW-11I-R2-RA2		11/29/2012	0.51		0.5	U	0.5	U	0.5	U
	MW-11I-R4-RA2		10/31/2014	0.24	J	0.5	U	0.17	J	0.5	U
MW-11D	MW-11D-B-RA2	128.7 - 138.7	9/2/2011	0.21	J	0.5	U	0.5	U	0.5	U
	MW-11D-R2-RA2		11/29/2012	**4.1**		**1.5**		5.4		0.5	U
	MW-11D-R4-RA2		10/31/2014	0.29	J	0.11	J	0.36	J	0.5	U
RA-GS-49	RA-GS-49-70-75	70 -75	5/14/2010	5	U	5	U	5	U	5	U
	RA-GS-49-80-85	80 - 85	5/14/2010	**11**		5	U	5	U	5	U
	RA-GS-49-90-95	90 - 95	5/14/2010	**29**		5	U	5	U	5	U
	RA-GS-49-100-105	100 - 105	5/14/2010	**17**		5	U	5	U	5	U
	RA-GS-49-110-115	110 - 115	5/14/2010	5	U	5	U	5	U	5	U
	RA-GS-49-120-125	120 - 125	5/17/2010	5	U	5	U	5	U	5	U
	RA-GS-49-130-135	130 - 135	5/17/2010	5	U	5	U	5	U	5	U
	RA-GS-49-140-145	140 - 145	5/17/2010	5	U	5	U	5	U	5	U
	RA-GS-49-150-155	150 - 155	5/17/2010	5	U	5	U	5	U	5	U
	RA-GS-49-160-165	160 - 165	5/17/2010	5	U	5	U	5	U	5	U

Table 3-5a
Groundwater VOC Results in Areas Downgradient of the Biobarrier
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Well ID	Sample Code	Sample Interval (feet bgs)	Sample Date	PCE		TCE		cis-1,2-DCE		Vinyl Chloride	
				µg/L		µg/L		µg/L		µg/L	
MW-35S	MW-35S-B-RA2	60 - 70	9/6/2011	**4.1**		0.38	J	0.26	J	0.5	U
	MW-35S-R2-RA2		11/30/2012	**2.6**		0.5	U	0.5	U	0.5	U
	MW-35S-R4-RA2		11/3/2014	**1.1**		0.11	J	0.5	U	0.5	U
MW-35I	MW-35I-B-RA2	90 - 100	9/6/2011	**14**		0.79		1.5		0.5	U
	MW-35I-R2-RA2		11/30/2012	**15**		**1.1**		1.1		0.5	U
	MW-35I-R4-RA2		11/3/2014	**13**		**1.2**		0.7		0.5	U
MW-35D	MW-35D-B-RA2	120 - 130	9/6/2011	0.5	U	0.5	U	0.5	U	0.5	U
	MW-35D-R2-RA2		11/30/2012	0.5	U	0.5	U	0.5	U	0.5	U
	MW-35D-R4-RA2		11/3/2014	0.5	U	0.5	U	0.5	U	0.5	U

Notes:

ID - identification
bgs - below ground surface
PCE - tetrachloroethene
TCE - trichloroethene
cis-1,2-DCE - cis-1,2-dichloroethene
µg/L - microgram per liter
J - estimated value
U - non-detect
VOC - volatile organic compound

Highlighted and bold values exceed the New Jersey Groundwater Quality Standard of 1 µg/L for PCE and TCE.

Table 3-5b
Groundwater Geochemistry Results in Area Downgradient of the Biobarrier
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Location	Sample Code	Sample Interval feet bgs	Sample Date	Alkalinity		TOC		Nitrate/ Nitrite		Fe 2+		Sulfate		Methane		Ethane		Ethene		pH	Specific Conductivity	DO	ORP
				mg/L		mg/L		mg/L		mg/L		mg/L		µg/L		µg/L		µg/L		std units	mS/cm	mg/L	mV
MW-37	MW37-B-RA2	72.5 - 82.5	9/8/2011	8.8		1	U	4.5		1.12		1	U	2	U	2	U	2	U	4.98	0.133	1.98	200.7
	MW-37-R1-RA2	76 - 86	4/18/2012	1.3		1		4.7		0.05		1	U	2	U	2	U	2	U	4.89	0.096	3.52	305.8
	MW-37-R2-RA2		11/30/2012	1.6		1	U	4.4		0.34		1	U	2	U	2	U	2	U	4.7	0.100	4.54	305.4
	MW-37-R4-RA2		10/30/2014	1.7		1		2.1		0.04		1	U	2	U	2	U	2	U	4.66	0.107	1.46	277.7
MW-38I	MW38I-B-RA2	90 - 100	9/8/2011	1.2		1.2		5.9		0.03	U	1	U	2	U	2	U	2	U	4.35	0.16	6.34	298.5
	MW-38I-R1-RA2	72 - 82	4/18/2012	3.8		1.7		6		0.03	U	1.9		2	U	2	U	2	U	4.95	0.199	6.95	345.3
	MW-38I-R2-RA2		11/30/2012	1.9		1.4		6.2		0.16		1.7		2	U	2	U	2	U	4.72	0.306	7.61	288
	MW-38I-R4-RA2		10/31/2014	2.7		4.1		5		0.05		5.6		2	U	2	U	2	U	4.55	0.093	6.33	188
MW-38D	MW38D-B-RA2	106 - 116	9/8/2011	1	U	1	U	8.3		0.03	U	1	U	2	U	2	U	2	U	4.34	0.154	3.1	312.3
	MW-38D-R1-RA2		4/18/2012	1	U	1	U	9.5		0.03	U	2		2	U	2	U	2	U	4.35	0.133	2.82	363.3
	MW-38D-R2-RA2		11/30/2012	1	U	1	U	9.9		0.15		1	U	2	U	2	U	2	U	4.17	0.148	3.22	323.6
	MW-38D-R4-RA2		10/31/2014	1	U	1	U	5.9		0.03	U	2.1		2	U	2	U	2	U	4.44	0.136	1.21	250.9
MW-11I	MW11I-B-RA2	99.1 - 109.1	9/2/2011	1	U	1	U	4.9		0.03	U	1	U	2	U	2	U	2	U	4.35	0.185	4.46	330.6
	MW-11I-R2-RA2		11/29/2012	1	U	1	U	5.5		0.07		1	U	2	U	2	U	2	U	4.58	0.236	3.76	241.4
	MW-11I-R4-RA2		10/31/2014	1	U	1	U	4.8		0.03	U	1	U	2.12		2	U	2	U	4.63	0.105	3.63	296.7
MW-11D	MW11D-B-RA2	128.7 - 138.7	9/2/2011	1	U	1	U	1.4		0.93		3.6		2	U	2	U	2	U	4.7	0.109	8.29	285.9
	MW-11D-R2-RA2		11/29/2012	1.3		1.1		2		0.23		2.2		2	U	2	U	2	U	4.88	0.180	6.70	255.9
	MW-11D-R4-RA2		10/31/2014	1	U	1	U	1.4		0.03	U	2.9		2	U	2	U	2	U	4.94	0.075	8.80	250.3
MW-35S	MW35S-B-RA2	60 - 70	9/6/2011	1	U	1	U	4		0.36		1	U	2	U	2	U	2	U	4.42	0.107	14.56	166.1
	MW-35S-R2-RA2		11/30/2012	1	U	1	U	3.8		0.34		1	U	2	U	2	U	2	U	4.75	0.108	5.98	230.5
	MW-35S-R4-RA2		11/3/2014	1.3		1	U	2.6		NA		1	U	2	U	2	U	2	U	4.64	0.131	7.52	293.3
MW-35I	MW35I-B-RA2	90 - 100	9/6/2011	1	U	1	U	8.8		0.03	U	1	U	2	U	2	U	2	U	4.55	0.134	4.73	193.9
	MW-35I-R2-RA2		11/30/2012	1.1		1	U	9.5		0.23		1	U	2	U	2	U	2	U	3.96	0.140	2.78	241.3
	MW-35I-R4-RA2		11/3/2014	16	J	1	U	9.8		NA		1	U	2	U	2	U	2	U	4.31	0.088	2.74	303.1
MW-35D	MW35D-B-RA2	120 - 130	9/6/2011	5.3		1	U	3.6		0.21		12		2	U	2	U	2	U	5.39	0.19	1.17	215.9
	MW-35D-R2-RA2		11/30/2012	1	U	1	U	4.3		1.66		32		2	U	2	U	2	U	4.23	0.205	0.47	199.4
	MW-35D-R4-RA2		11/3/2014	100	J	1	U	6.2		NA		15		2	U	2	U	2	U	4.16	0.164	1.39	322.9

Notes:

bgs - below ground surface
DO - dissolved oxygen
µg/L - microgram per liter
mV - millivolt
TOC - total organic carbon
ORP - oxidation-reduction potential
std - standard
U - non-detect
Fe 2+ - ferrous iron
mg/L - milligram per liter
mS/cm - milliSiemen per centimeter
NA - Not Analyzed

Table 3-6
QuantArray Results
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Parameters	MW-30-R4-RA2		MW-04I-R4-RA2		MW-07I-R4-RA2		MW-36-R4-RA2		MW-47-R4-RA2		MW-37-R4-RA2	
	Cell/mL		Cell/mL		Cell/mL		Cell/mL		Cell/mL		Cell/mL	
ReductiveDechlorination												
Dehalococcoides spp. (DHC)	5.00E-01	<	**3.00E-01**	J	**1.54E+02**		**3.60E+00**		**1.25E+01**		5.00E-01	<
tceA Reductase (TCE)	5.00E-01	<	5.00E-01	<	**8.89E+01**		5.00E-01	<	5.00E-01	<	5.00E-01	<
BAV 1 Vinyl Chloride Reductase (BVC)	5.00E-01	<	5.00E-01	<	5.00E-01	<	5.00E-01	<	5.00E-01	<	5.00E-01	<
Vinyl Chloride Reductase (VCR)	5.00E-01	<	5.00E-01	<	**5.50E+00**		5.00E-01	<	5.00E-01	<	5.00E-01	<
Dehalobacter spp. (DHBt)	**1.29E+03**		5.00E+00	<	**3.52E+03**		5.00E+00	<	**1.30E+04**		5.10E+00	<
Dehalobacter DCM (DCM)	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.10E+00	<
Dehalogenimonas spp. (DHG)	**3.39E+04**		**2.35E+01**		**4.98E+04**		5.00E+00	<	**9.79E+03**		5.10E+00	<
Desulfitobacterium spp. (DSB)	**4.80E+03**		**3.93E+01**		**1.89E+04**		**4.00E-01**	J	**3.23E+04**		5.10E+00	<
Dehalobium chlorocoercia (DECO)	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.10E+00	<
Desulfuromonas sppl (DSM)	5.00E+00	<	5.00E+00	<	**1.76E+01**		5.00E+00	<	5.00E+00	<	5.10E+00	<
Chloroform reductase (CFR)	**7.00E-01**	J	5.00E+00	<	**3.00E-01**	J	5.00E+00	<	**2.85E+01**		5.10E+00	<
Aerobic (Co)Metabolic												
Soluble Methane Monooyxgenase (SMMO)	**1.80E+04**		**2.53E+03**		**5.32E+04**		**3.45E+02**		**9.91E+02**		5.10E+00	<
Particulate Methane Monooxygenase (PMMO)	**1.51E+03**		**2.50E+02**		**5.43E+03**		**4.85E+01**		**4.30E+01**		5.10E+00	<
Toluene Dioxygenase (TOD)	**1.63E+02**		**2.62E+02**		**5.56E+02**		**7.53E+01**		**4.58E+01**		**3.00E-01**	J
Phenol Hydroxylase (PHE)	**1.32E+01**		**2.44E+03**		**2.94E+03**		5.00E+00	<	**2.47E+03**		5.10E+00	<
Trichlorobenzene Dioxygenase (TCBO)	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.10E+00	<
Toluene Monooxygenase 2 (RDEG)	5.00E+00	<	**8.99E+01**		**2.54E+02**		5.00E+00	<	**1.18E+04**		**6.80E+00**	
Toluene Monooyxgenase (RMO)	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.10E+00	<
Ethene Monooxygenase (EtnC)	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.10E+00	<
Epoxyalkane transferase (EtnE)	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.00E+00	<	5.10E+00	<
Other												
Total Eubacteria (EBAC)	**3.22E+06**		**1.26E+06**		**8.96E+06**		**2.07E+05**		**2.14E+06**		**1.72E+03**	
Sulfate Reducing Bacteria (APS)	**8.17E+05**		**1.58E+05**		**1.16E+06**		**6.99E+04**		**4.46E+05**		5.10E+00	<
Methanogens (MGN)	**4.21E+03**		**1.18E+02**		**2.50E+05**		**4.11E+01**		**4.32E+03**		5.10E+00	<

Notes

<: below reporting limit

J: estimated results

cell/mL - cell per milliliter

Table 4-1
Proposed Additional Wells and Rationale
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, New Jersey

Proposed Well ID	Location	Approximate Screen Interval (feet bgs)	Rationale
MW-49	Approximately 500 feet north/ northwest of the MW-6 cluster	55-65	• Monitor the northern boundary of the contaminant plume with concentration above New Jersey Groundwater Quality Standards (NJGQS)
MW-50	Approximately 350 feet north of the Treatability Study Area (MW-7 cluster), in the vicinity of RA-GS 10, RA-GS-14 and RA-GS-36	65-75	• Monitor hot spot in the vicinity of RA-GS 10, RA-GS-14 and RA-GS-36. These RA groundwater screening points had PCE concentrations above 50 µg/L, as follows: RA-GS 10 (200 µg/L from 70-74 feet bgs), RA-GS-14 (82 µg/L from 65-69 feet bgs and 110 µg/L from 70-74 feet bgs) and RA-GS-36 (97 µg/L from 69-74 feet bgs) • Screen interval in the same general interval as RA-GS 10, RA-GS-14 and RA-GS-36 • Area for proposed additional treatment
MW-51	Approximately 300 feet south of the Treatability Study Area (MW-7 cluster), in the southwest corner of 1196 Garrison Road	78-88	• Monitor area with PCE > 50 µg/L south of the treatability study area • Area for proposed additional treatment • PCE concentration at RA-GS-30 (200 µg/L from 80 to 84, 88 µg/L from 86 to 90) • Screen interval may be adjusted based on results of groundwater screening and lithology boring
MW-52	West side of South Orchard Road; approximately 1,600 feet west of MW-33I and 450 feet north/northwest of MW-48	75-85	• Monitor the northwestern boundary of the plume
MW-53	East side of South Orchard Road; approximately 500 feet southeast of the MW-11 cluster	115-125	• Monitor the southeastern boundary of the plume • Screen interval between MW-11I and MW-11D
MW-54	North side of Sherman Road; approximately 1,200 feet southwest of the MW-35 cluster	90-100	• Sentinel well to monitor downgradient of the leading edge (southwestern boundary) of the plume • Proposed screen interval equivalent to MW-35I, final screen interval will be determined using groundwater screening results

Acronyms:
ID - identification
bgs - below ground surface
µg/L – microgram per liter

Table 4-2
Proposed Groundwater Screening Sample Intervals
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Well ID	Groundwater Screening Interval (feet bgs)	Analytical Parameter Low Level VOC
RA-GS-61	60 - 64	X
RA-GS-61	66 - 70	X
RA-GS-61	71 - 75	X
RA-GS-61	76 - 80	X
RA-GS-62	60 - 64	X
RA-GS-62	66 - 70	X
RA-GS-62	71 - 75	X
RA-GS-62	76 - 80	X
RA-GS-63	60 - 64	X
RA-GS-63	66 - 70	X
RA-GS-63	71 - 75	X
RA-GS-63	76 - 80	X
RA-GS-63	81 - 85	X
RA-GS-64	66 - 70	X
RA-GS-64	71 - 75	X
RA-GS-64	76 - 80	X
RA-GS-64	81 - 85	X
RA-GS-64	86 - 90	X
RA-GS-65	66 - 70	X
RA-GS-65	71 - 75	X
RA-GS-65	76 - 80	X
RA-GS-65	81 - 85	X
RA-GS-65	86 - 90	X
RA-GS-65	91-95	X
RA-GS-66	60 - 64	X
RA-GS-66	66 - 70	X
RA-GS-66	71 - 75	X
RA-GS-66	76 - 80	X
RA-GS-66	86 - 90	X
RA-GS-66	91-95	X
RA-GS-67	60 - 64	X
RA-GS-67	66 - 70	X
RA-GS-67	71 - 75	X
RA-GS-67	76 - 80	X
RA-GS-67	86 - 90	X
RA-GS-67	91 - 95	X
RA-GS-68	66 - 70	X
RA-GS-68	71 - 75	X
RA-GS-68	76 - 80	X
RA-GS-68	81 - 85	X
RA-GS-68	86 - 90	X

Table 4-2
Proposed Groundwater Screening Sample Intervals
Stage 2 Remedial Action
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

Well ID	Groundwater Screening Interval (feet bgs)	Analytical Parameter Low Level VOC
RA-GS-68	91 - 95	X
RA-GS-68	96-100	X
RA-GS-69	76 - 80	X
RA-GS-69	81 - 85	X
RA-GS-69	86 - 90	X
RA-GS-69	91-95	X
RA-GS-69	96 - 100	X
RA-GS-69	101 - 105	X
RA-GS-70	76 - 80	X
RA-GS-70	81 - 85	X
RA-GS-70	86 - 90	X
RA-GS-70	91-95	X
RA-GS-70	96 - 100	X
RA-GS-70	101 - 105	X
RA-GS-71	76 - 80	X
RA-GS-71	81 - 85	X
RA-GS-71	86 - 90	X
RA-GS-71	91-95	X
RA-GS-71	96 - 100	X
RA-GS-71	101 - 105	X
RA-GS-72	76 - 80	X
RA-GS-72	81 - 85	X
RA-GS-72	86 - 90	X
RA-GS-72	91-95	X
RA-GS-72	96 - 100	X
RA-GS-72	101 - 105	X

Notes:

bgs = below ground surface

ID = Identification

VOC = volatile organic compound

X = sample to be collected

Shaded intervals may not be collected

Figures

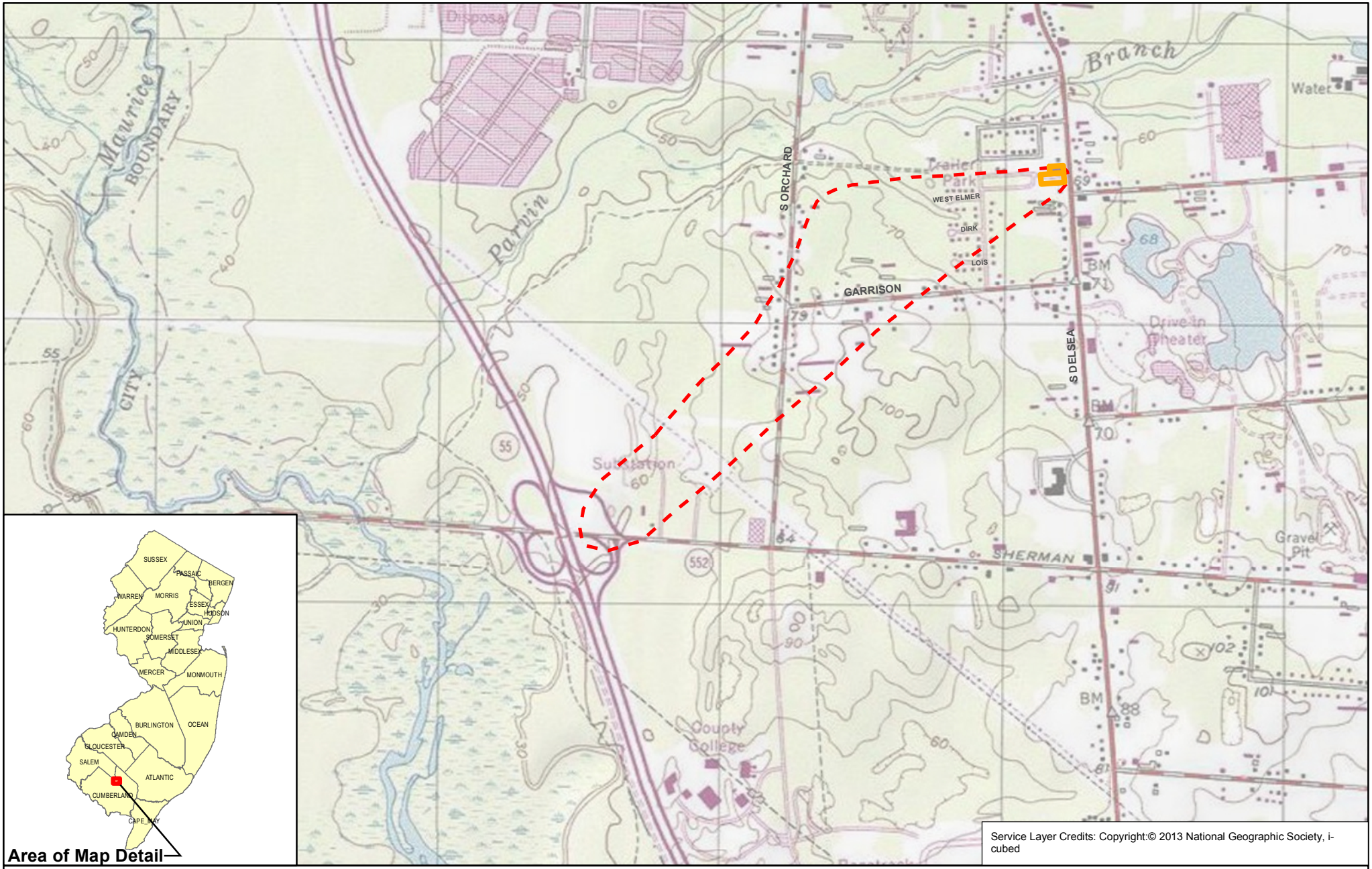
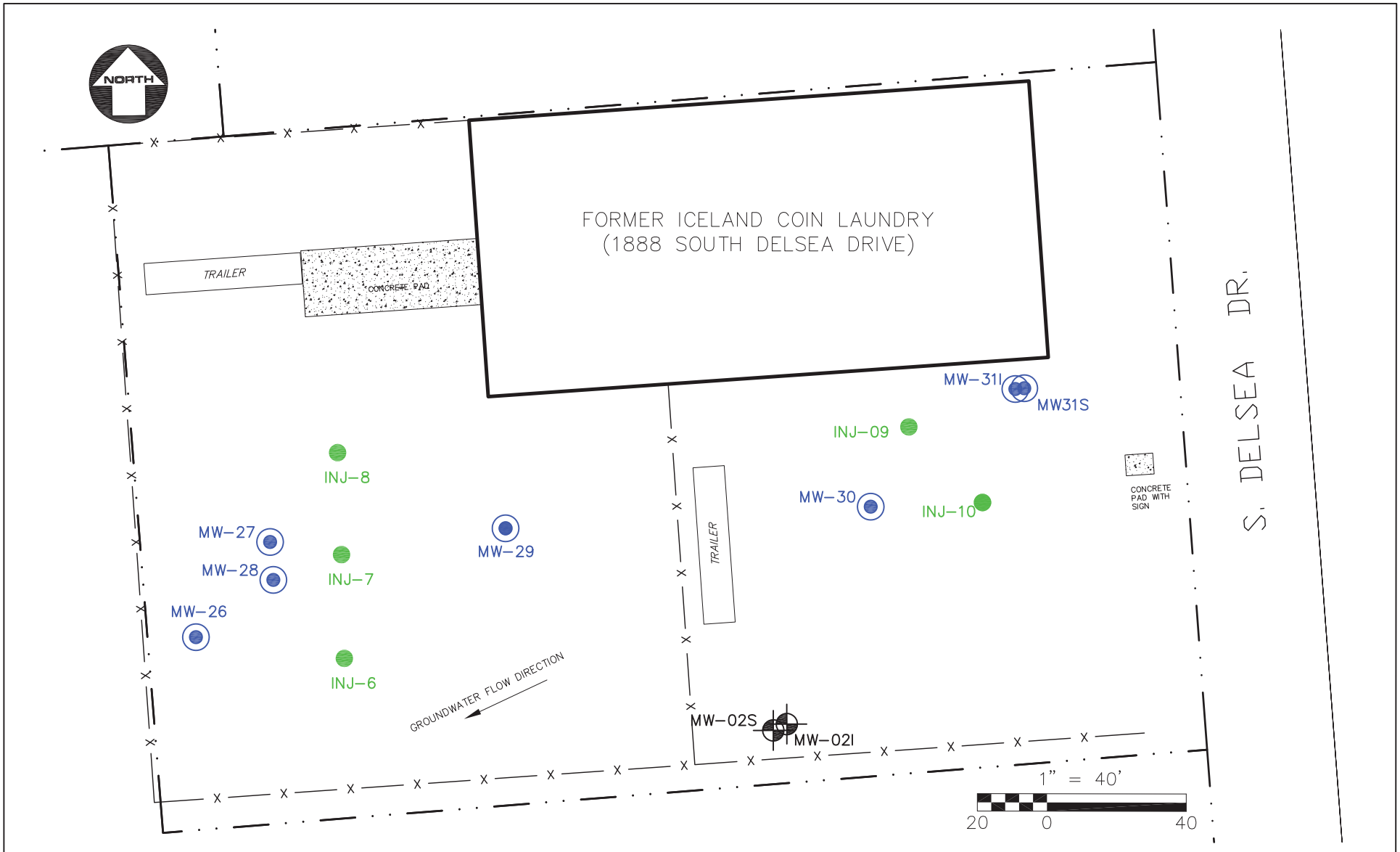


Figure 1-1
Site Location Map
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith

Path: R:\68991_Iceland\02_MXD\Round3Report\Figure_1-1SiteLocation.mxd Date Saved: 7/23/2014 11:58:44 AM



RI Monitoring Well

Injection Well

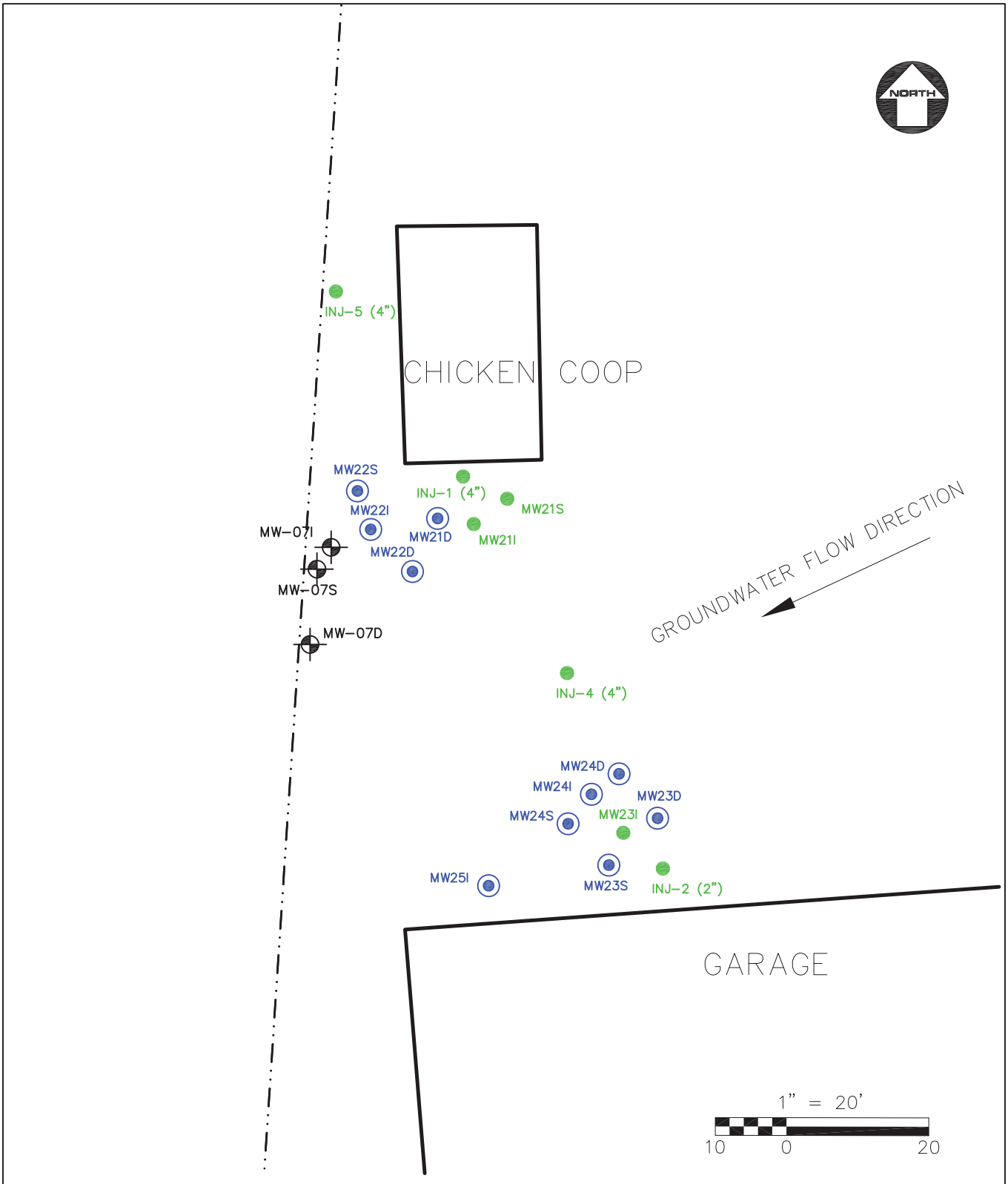
Monitoring Well

Fence

Property Boundary

Figure 1-2
Facility Area Injection Layout
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith



Property Boundary

Injection Well

Monitoring Well

RI Monitoring Well

Figure 1-3
Treatability Study Area Injection Layout
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith

Legend

- Abandoned Biobarrier Extraction Well
- Existing Monitoring Well
- Biobarrier Injection Well
- Abandoned Biobarrier Injection Well

Note:
PZ - Piezometer
S - Shallow Well
I - Intermediate Well
D - Deep Well

N
W E
S

0 50 100 200 Feet

Figure 1-4
Biobarrier Injection Layout
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith

Path: R:\68991_Iceland\02_MXD\Round3Report\Figure 1-4_BiobarrierInjectionLayout.mxd Date Saved: 7/23/2014 4:41:37 PM

Legend

- Former Iceland Coin Laundry Facility
- Treatability Study Area
- Monitoring Well
- Biobarrier Injection Well

Note:
PZ - Piezometer
S - Shallow Well
I - Intermediate Well
D - Deep Well

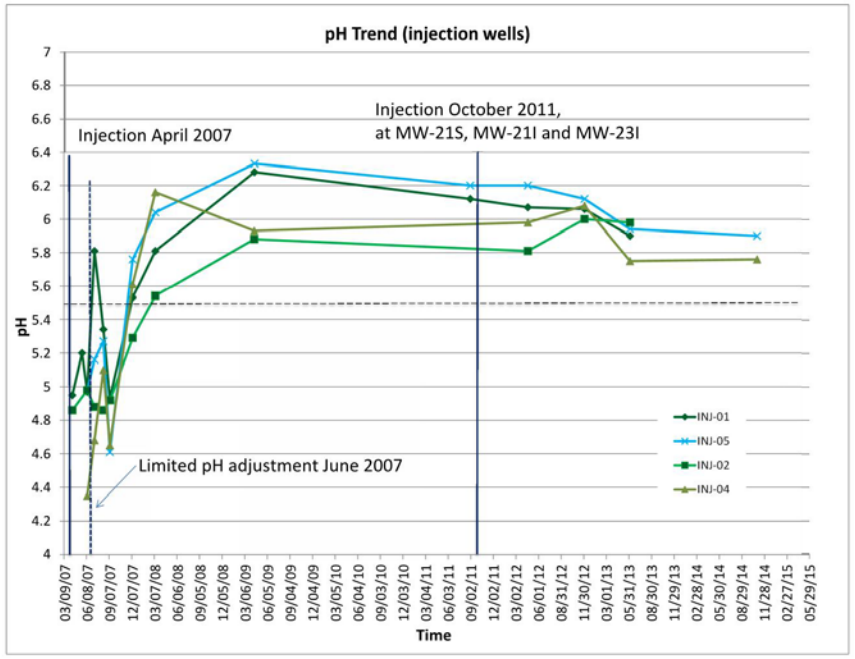
N
W E
S

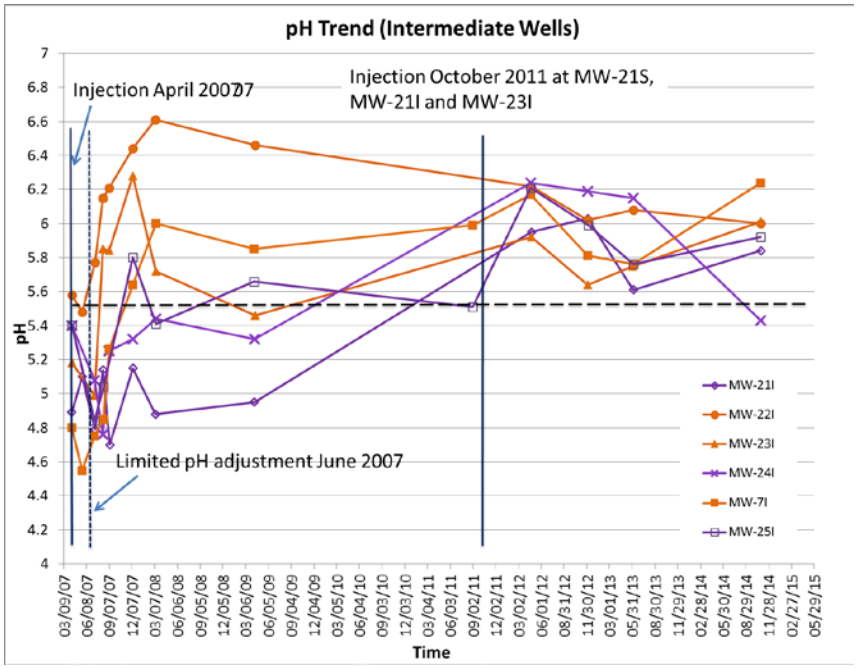
0 200 400 800
Feet

Figure 1-5
Bioremediation Treatment Areas
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith

Path: R:\68991_Iceland\02_MXD\Round3Report\Figure 1-5_Site Areas.mxd Date Saved: 7/23/2014 12:00:27 PM





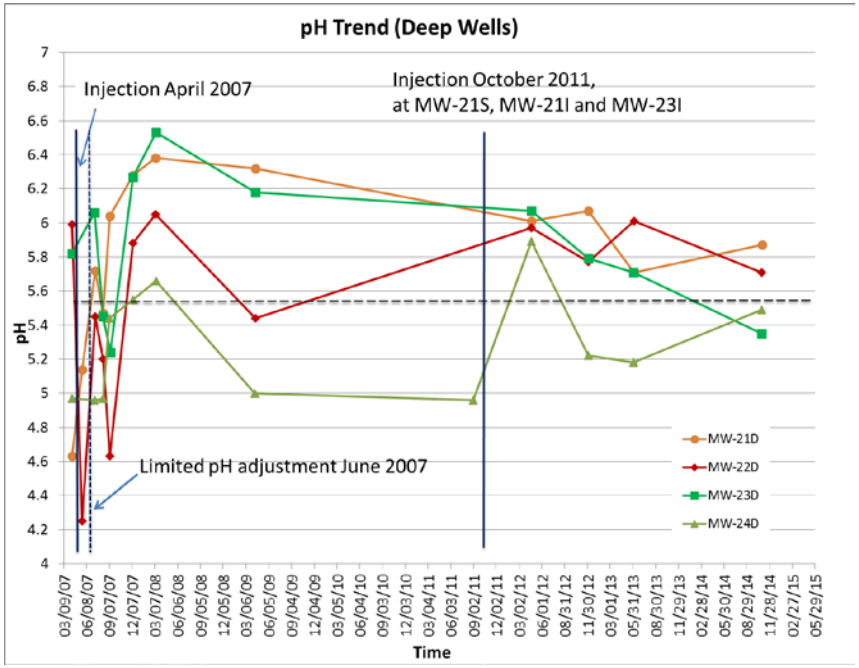
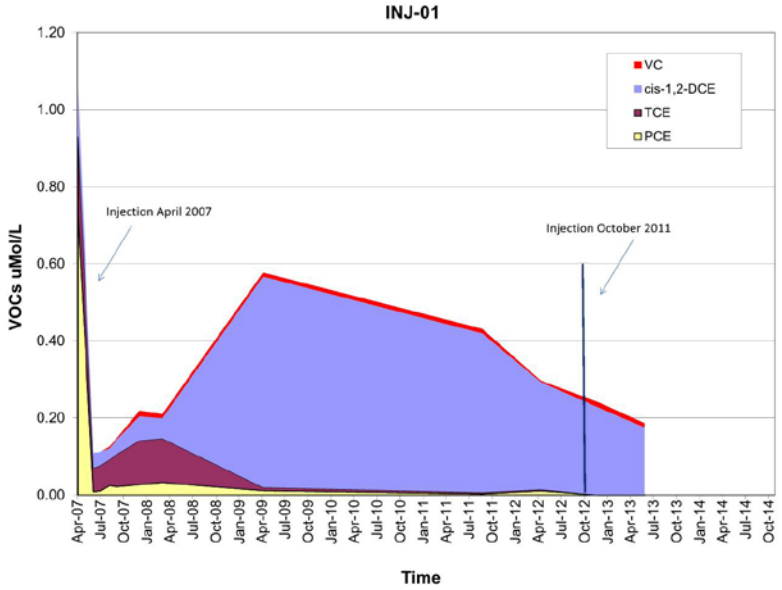
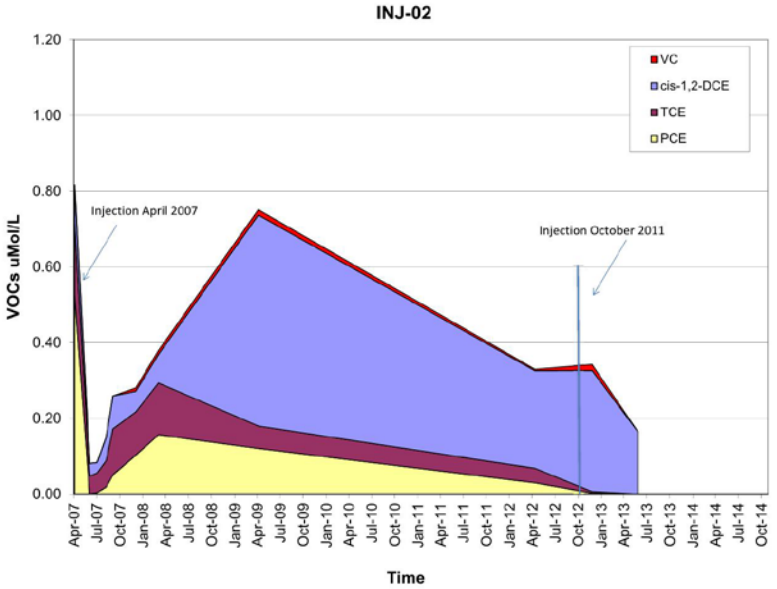
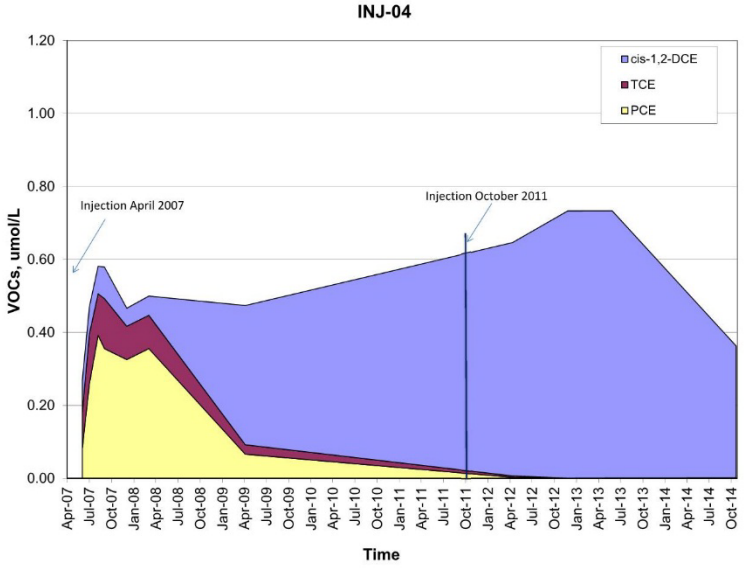


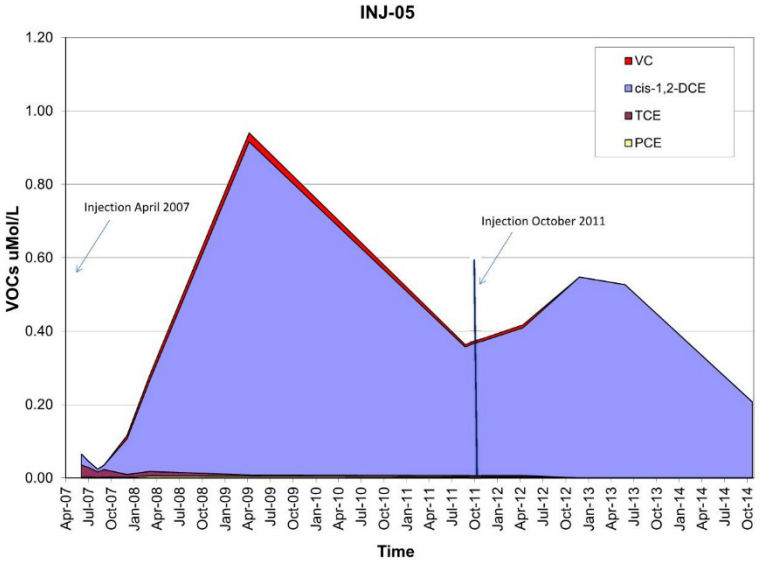
Figure 3-1
pH Trend
Treatability Study Area
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith





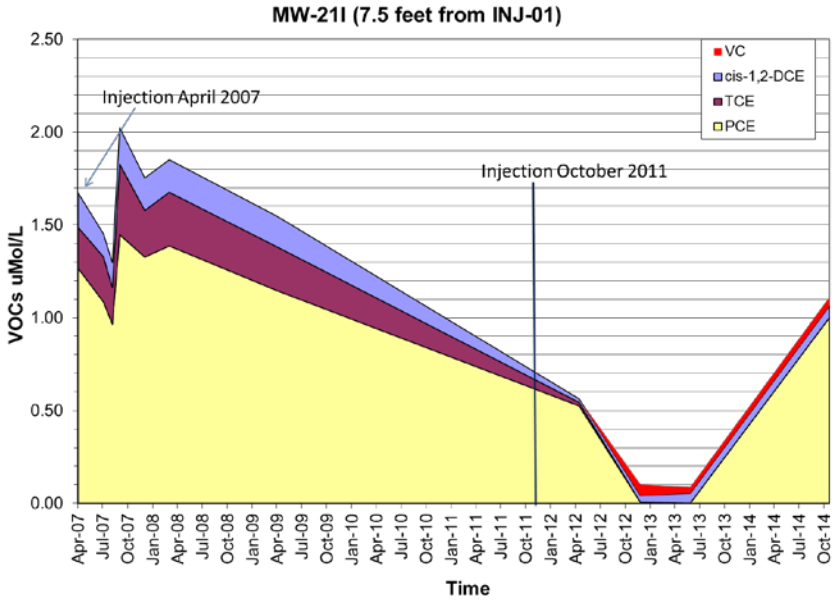


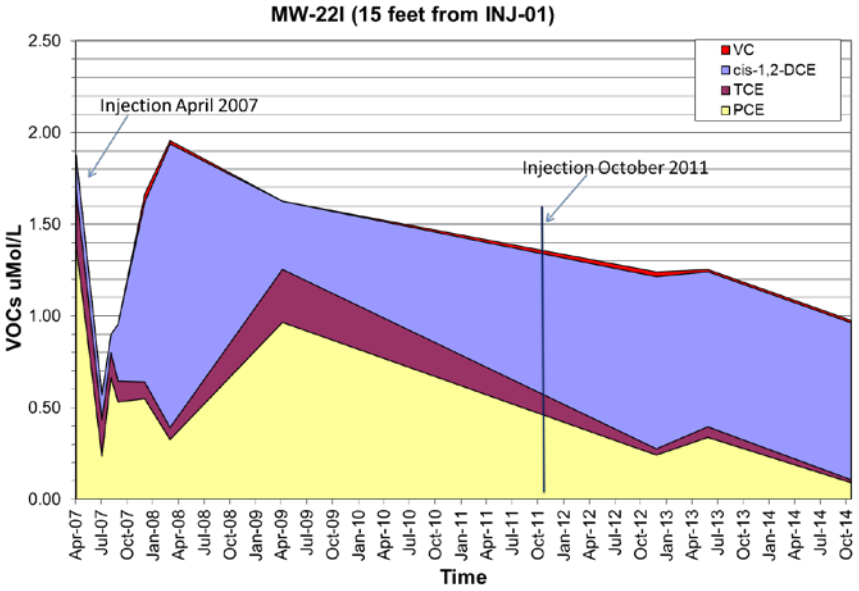


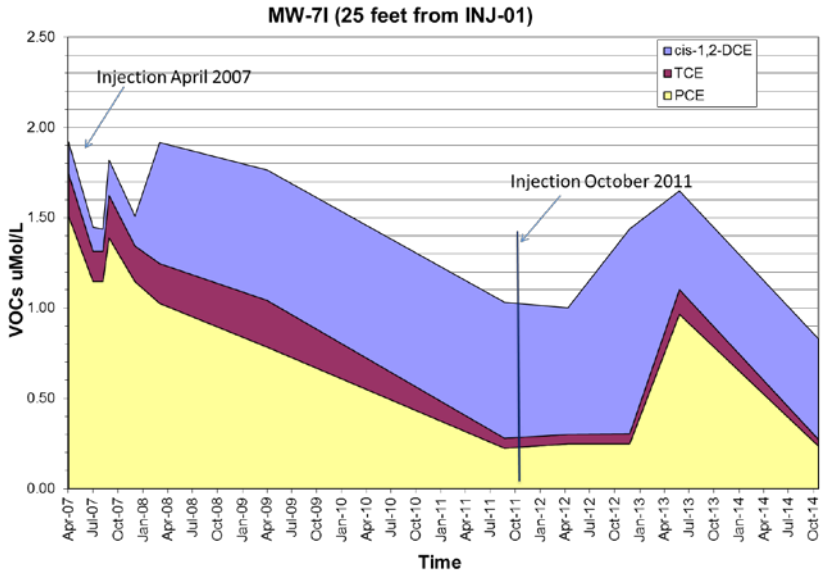
VC – vinyl chloride; cis-1,2-DCE – cis-1,2-dichloroethene;
TCE – trichloroethene; PCE - tetrachloroethene

Figure 3-2a
Contaminant Concentration Trend – Injection Wells
Treatability Study Area
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith



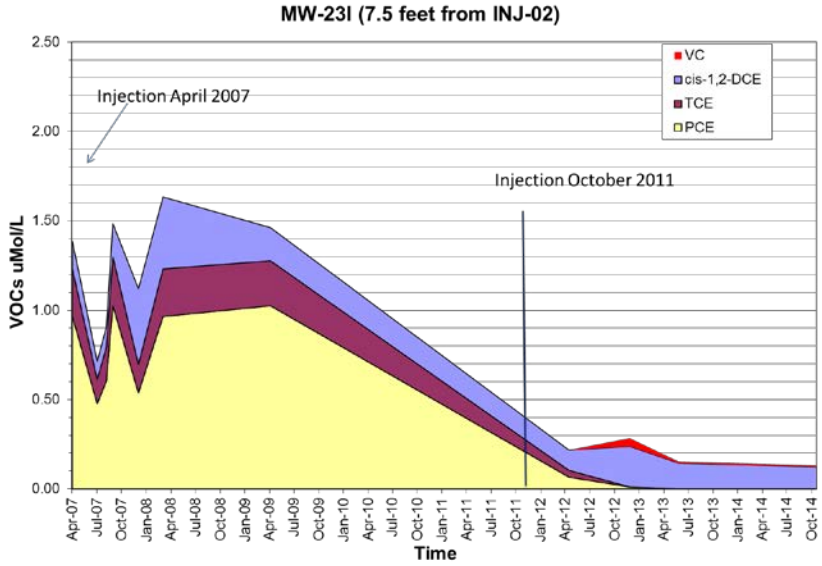


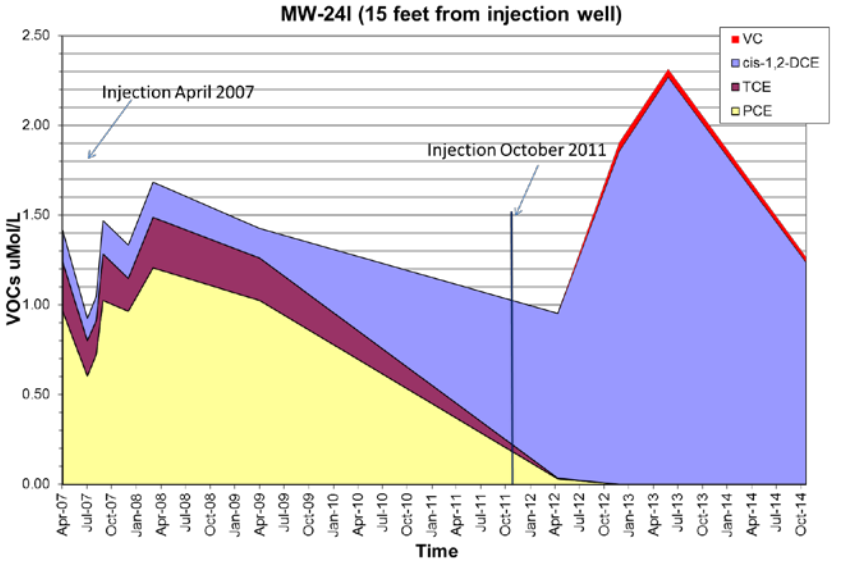


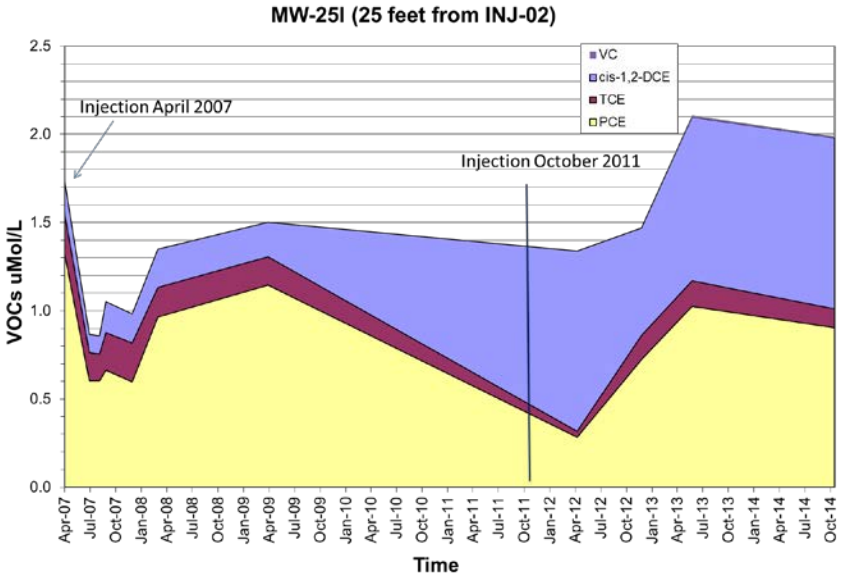
VC – vinyl chloride; cis-1,2-DCE – cis-1,2-dichloroethene;
TCE – trichloroethene; PCE - tetrachloroethene

Figure 3-2b
Contaminant Concentration Trend – Intermediate Wells
for INJ-01
Treatability Study Area
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith



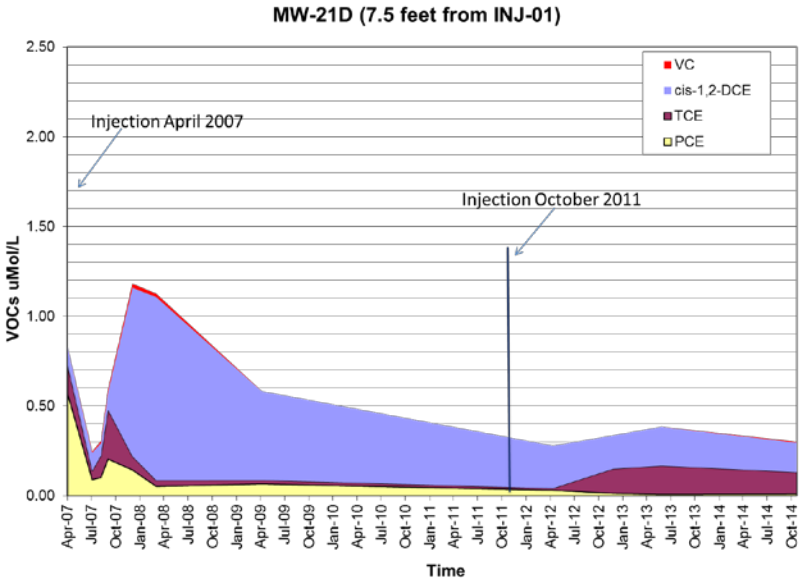


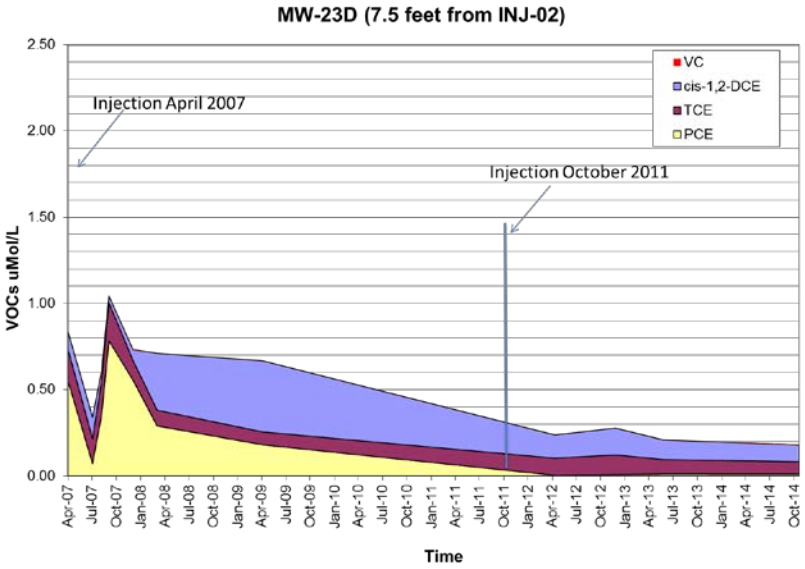


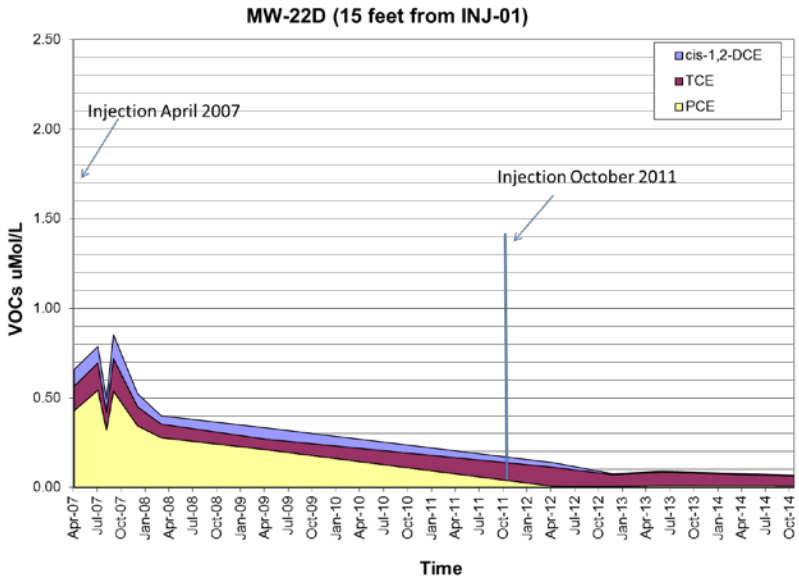
VC – vinyl chloride; cis-1,2-DCE – cis-1,2-dichloroethene;
TCE – trichloroethene; PCE - tetrachloroethene

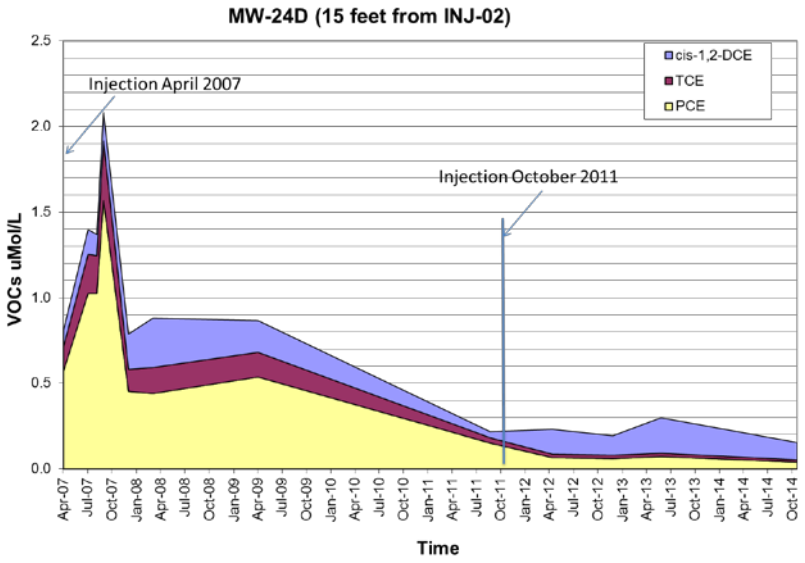
Figure 3-2c
Contaminant Concentration Trend – Intermediate Wells
for INJ-02
Treatability Study Area
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith





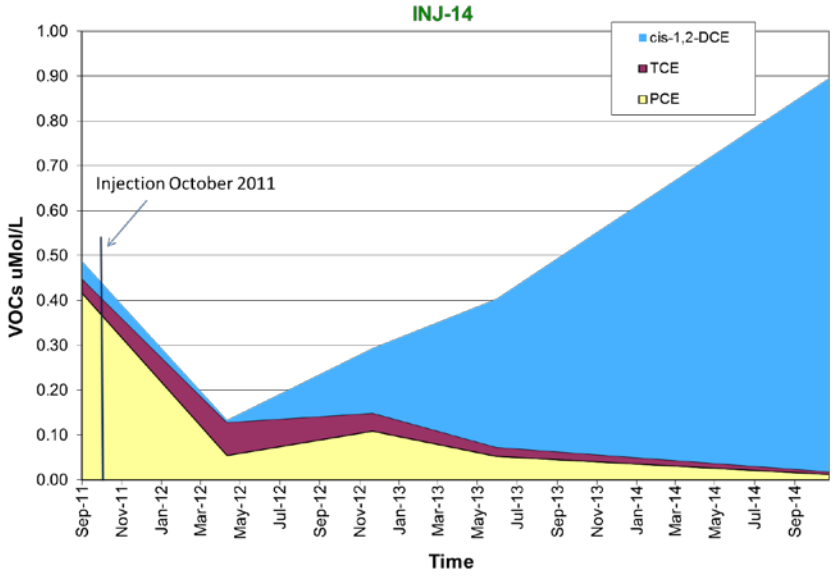


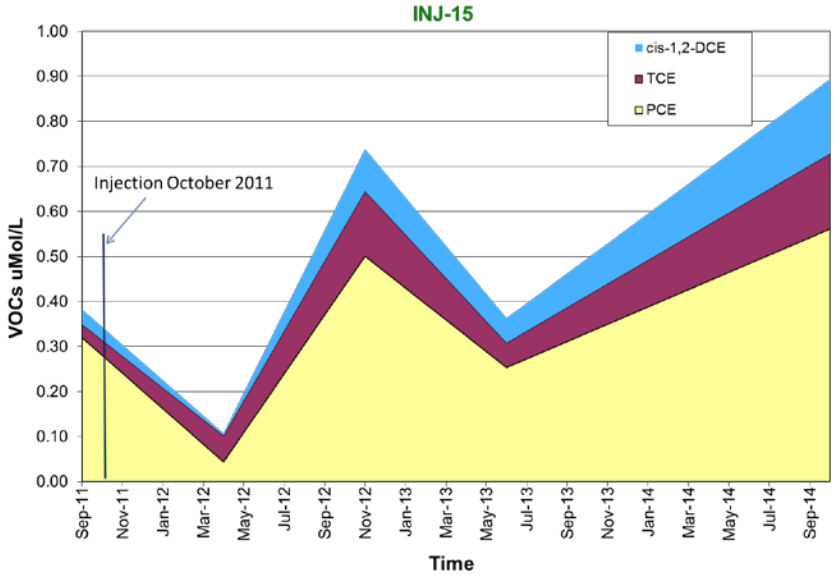


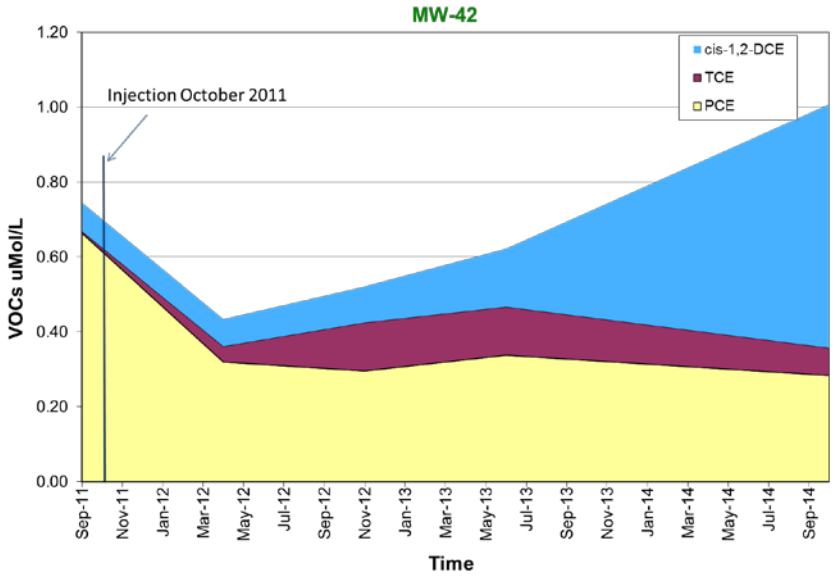
VC – vinyl chloride; cis-1,2-DCE – cis-1,2-dichloroethene;
TCE – trichloroethene; PCE - tetrachloroethene

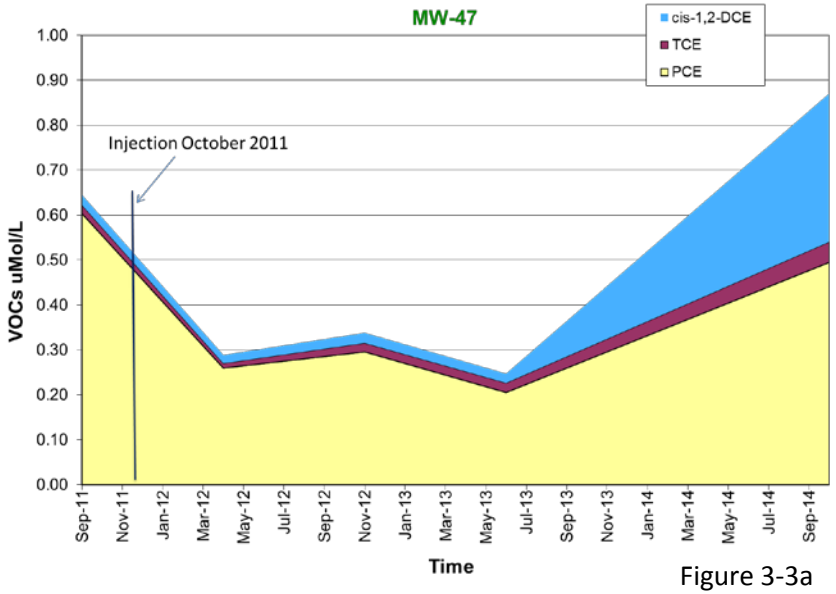
Figure 3-2d
Contaminant Concentration Trend – Deep Wells
Treatability Study Area
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith





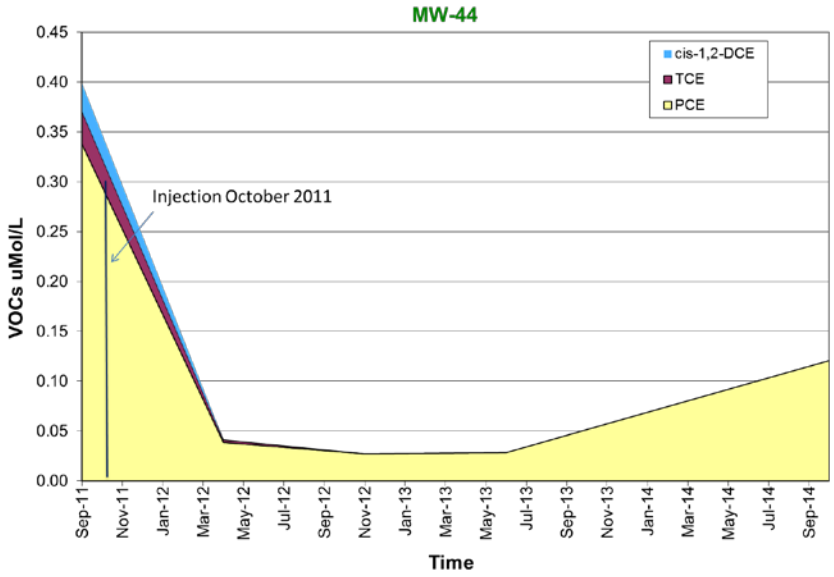


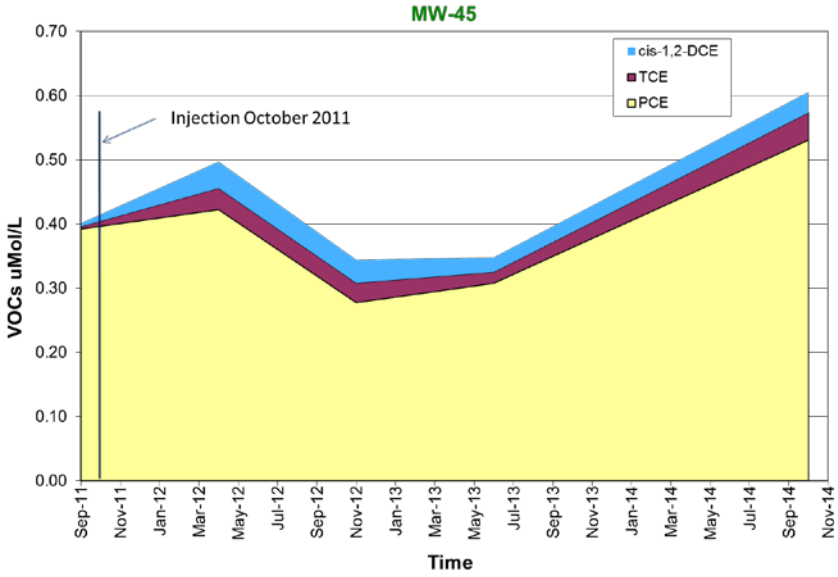


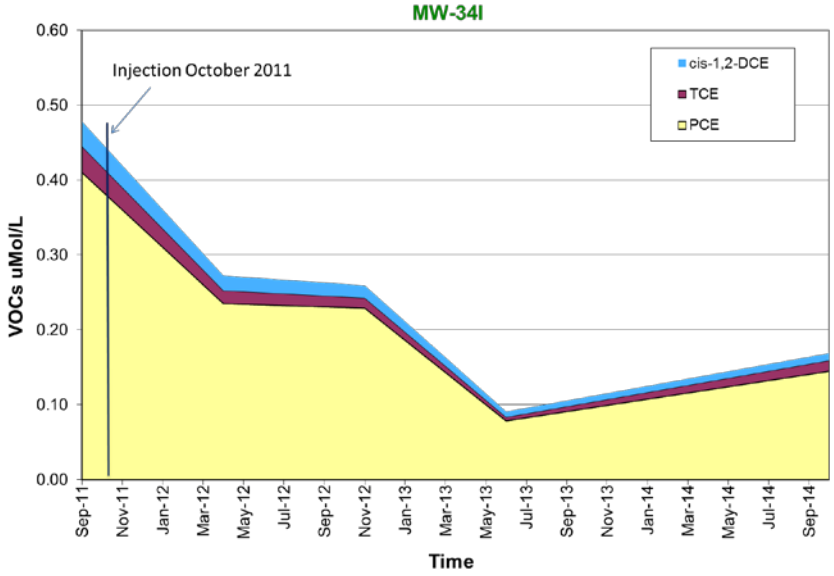
cis-1,2-DCE – cis-1,2-dichloroethene;
TCE – trichloroethene; PCE - tetrachloroethene

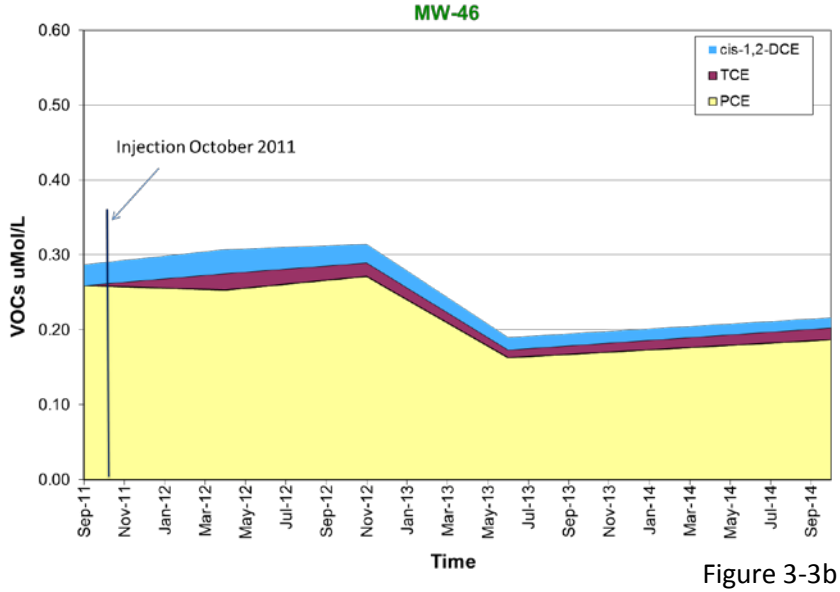
Figure 3-3a
Contaminant Concentration Trend
Northern Biobarrier Area
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith





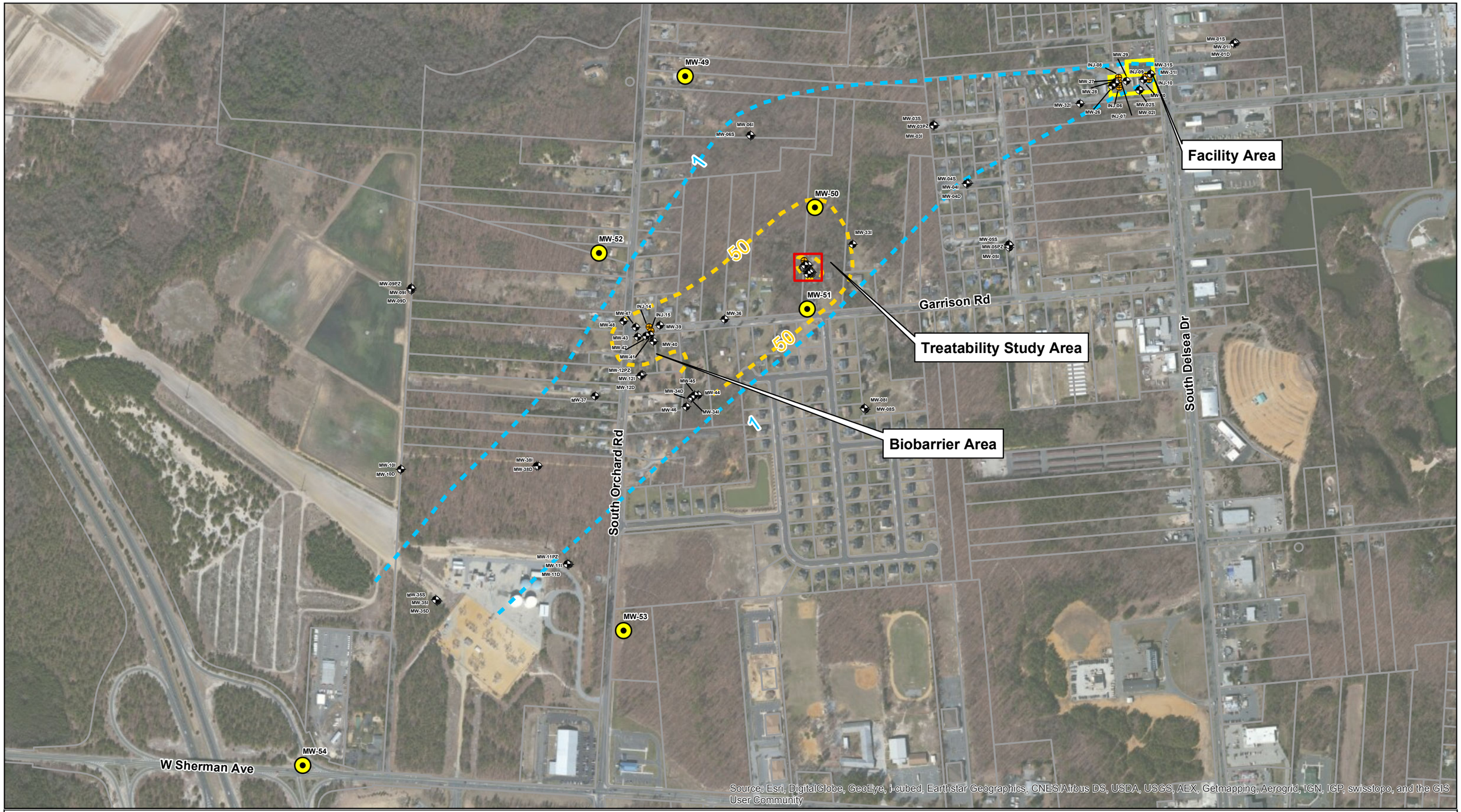




cis-1,2-DCE – cis-1,2-dichloroethene;
TCE – trichloroethene; PCE - tetrachloroethene

Figure 3-3b
Contaminant Concentration Trend
Southern Biobarrier Area
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith



Legend

- Former Iceland Coin Laundry Facility (Facility Area)
- Treatability Study Area
- Parcel
- Proposed Monitoring Well
- Injection Well
- Monitoring Well
- Estimated 1 µg/L PCE Isopleth (Round 2)
- Estimated 50 µg/L PCE Isopleth (Round 2)

Notes:
PZ - Piezometer Well
S - Shallow Well
I - Intermediate Well
D - Deep Well

N
W E
S

1 inch = 700 feet

0 700 1,400 2,100 Feet

Figure 4-1
Extent of Contaminant Plume and Proposed Monitoring Wells
Stage 2 Round 4 and Stage 1 RA Data
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith

Path: R:\68991_Iceland\02_MXD\Round4Report\Figure_1_Proposed_Well_Locations_acs_20130611.mxd Date Saved: 1/15/2015 2:00:58 PM

MW-36	92-102 feet bgs	
Date	Tetrachloroethene	
9/6/2011	34	
4/23/2012	**140**	
11/28/2012	**150**	
6/5/2013	**120**	
10/29/2014	**92**	

RA-GS-07	9/21/2009	
Depth, feet bgs	Tetrachloroethene	
60-64	5	U
70-74	5	U
80-84	21	
90-94	**100**	
100-104	2.5	J
110-114	5	U
120-124	5	U

MW-39	79-84 feet bgs
Date	Tetrachloroethene
9/7/2011	**88**
4/18/2012	**59**
11/28/2012	**100**
6/6/2013	**93**
10/30/2014	**89**

INJ-15	76-86 feet bgs
Date	Tetrachloroethene
8/30/2011	**53**
4/18/2012	7.2
11/28/2012	**83**
6/6/2013	42
10/31/2014	**93**

MW-41	75-85 feet bgs
Date	Tetrachloroethene
9/7/2011	**99**
4/17/2012	**60**
11/28/2012	**88**
6/6/2013	**77**
10/30/2014	**110**

RA-GS-06	9/22/2009	
Depth, feet bgs	Tetrachloroethene	
60-64	0.91	J
70-74	3.3	J
80-84	27	
90-94	**76**	
100-104	1.5	J
110-114	5	U
120-124	5	U

Tetrachloroethene less than 50 µg/L

MW-25I	75 - 85 feet bgs
Date	Tetrachloroethene
4/9/2009	**190**
8/31/2011	**130**
4/19/2012	**47**
12/5/2012	**120**
6/4/2013	**170**
10/27/2014	**150**

RA-GS-14	9/30/2009	
Depth, feet bgs	Tetrachloroethene	
58-62	8.8	
65-69	**82**	
70-74	**110**	
75-79	4.5	J
84-88	2.6	J

RA-GS-10	9/25/2009	
Depth, feet bgs	Tetrachloroethene	
9/25/2009	3.9	J
60-64	18	
70-74	**200**	
80-84	1.3	J
90-94	8.4	
100-104	5	U
110-114	5	U

RA-GS-30	10/8/2009	
Depth, feet bgs	Tetrachloroethene	
65-69	7.6	
72-76	11	
80-84	**200**	
86-90	**88**	
89-93	13	

RA-GS-09	9/24/2009	
Depth, feet bgs	Tetrachloroethene	
60-64	2.5	J
70-74	5	
80-84	18	
90-94	**82**	
100-104	**84**	
110-114	5	U
120-124	5	U

COULTER, ELISA L
1254 GARRISON RD

S Orchard St

Garrison Rd

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Monitoring Well
Proposed Monitoring Well
Lithology Boring
Proposed Groundwater Screening Location
Results in microgram per liter

Injection Well
Previous Groundwater Screening Point
Estimated 50 µg/L Tetrachloroethene Plume
Parcel

0 75 150 300 Feet

Figure 4-2
Proposed Groundwater Screening and Lithologic Boring Locations
Iceland Coin Laundry Superfund Site
Vineland, Cumberland County, New Jersey

CDM Smith

angellja R:\68991_Iceland\02_MXD\Round4Report\Figure_4-2_Proposed_GW_Lithology_17x11wParcelInfo.mxd 2/9/2015